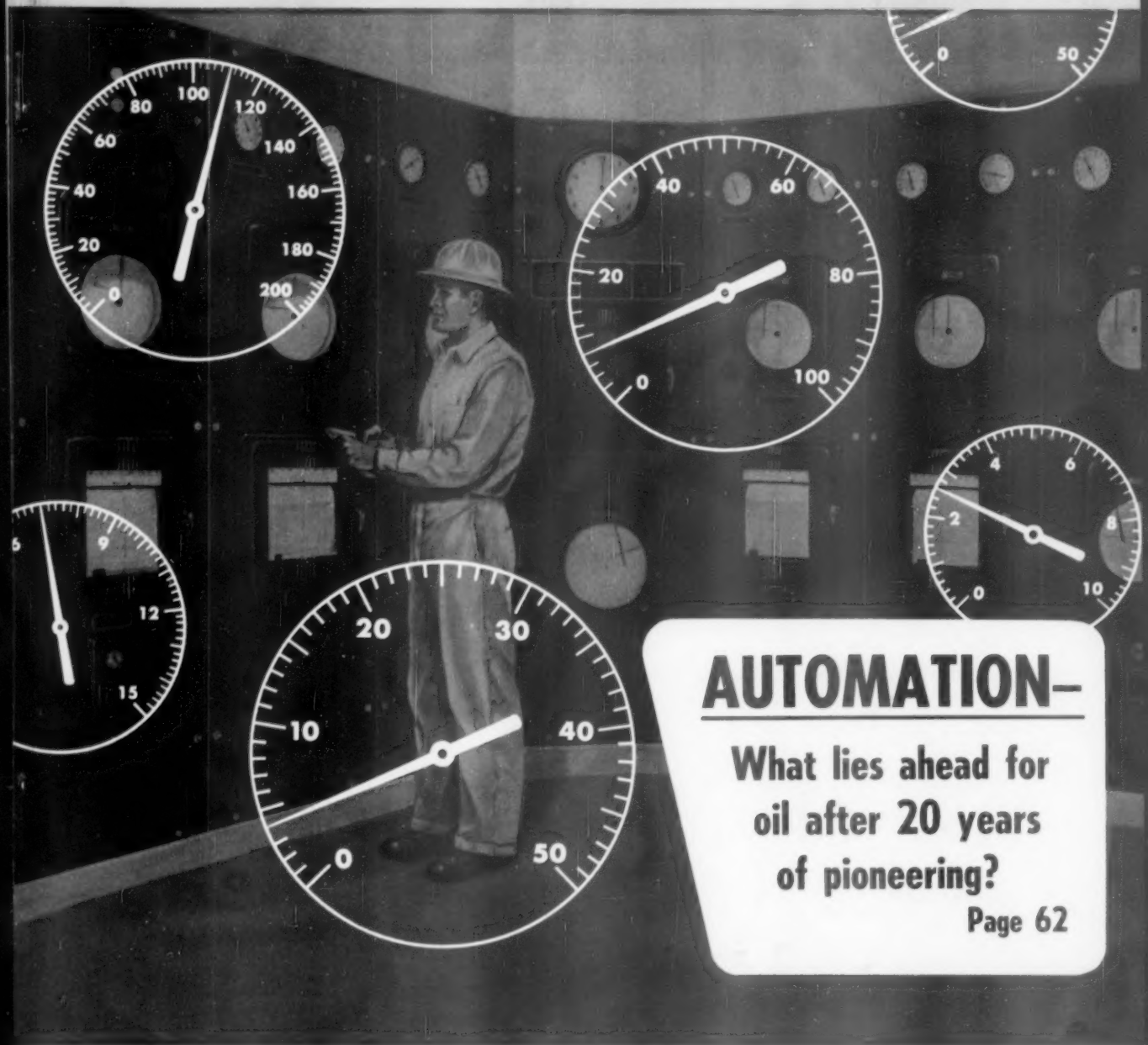
June 27, 1955

the OIL AND GAS JOURNAL



AUTOMATION—

What lies ahead for oil after 20 years of pioneering?

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- **Electronic control of catformer "continuous and dependable" • P. 82**
- **Report: Plantation's experience with unattended pump stations • P. 87**

Put New Profits in Production with Rockwell-Nordstrom Valves

Valves are always a vital part of the investment in any petroleum installation. Valve efficiency is a very important item in determining profits on *your* operations.

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Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-
Nordstrom **VALVES**

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

PAGE 1 ONE ... *a glance ahead*

Completion of St. Lawrence seaway, in 1959, will have negligible effect on oil movements. Long, slow trip and 27-ft. depth will not invite big ocean tankers. Since navigation will be closed in winter, Great Lakes water movement will not supplant pipelines.

Action against oil imports will be pressed on administration immediately now that Trade Agreements bill has become law. Several avenues of administrative procedure are possible, but domestic producers will start by seeking direct action from ODM, the source of the cabinet recommendation to hold imports to 1954 levels.

Crude market in Rockies is firmer now than last year when numerous sales below postings raised fears that entire Mid-Continent price structure was endangered. Some crude there is still without a home, but short-range prospect is that Rockies production will not increase faster than market can absorb.

Failure of all Rocky Mountain legislatures to consider proration legislation may not be as much of a threat to Great Lakes-area markets of southwestern states as operators there believe. Production and marketing may become a little more orderly as several states are tightening their conservation administration and many operators have become aware of dangers of chaotic overproduction.

Drilling with air instead of mud in suitable formations, particularly in certain areas of the Rockies, cuts penetration costs so much that some operators are spreading their wildcatting and drilling budgets further, finding it economical to develop pays formerly considered marginal.

Successful experiments of several railroads with oil-burning gas-turbine locomotives lead some refiners to feel that the days of the railroad diesel are numbered and that railroads will once again be big buyers of heavy fuel oil.

the OIL AND GAS JOURNAL

JUNE 27, 1955 • VOLUME 54 • NUMBER 8

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TECHNOLOGY—OPERATION

Electronic Control of a Catformer Unit 82

By F. C. Somers and R. C. Fuhs

Atlantic's 8,000-bbl. per day Catformer has now been operated 10 months using an electronic control system. The start-up was routine and subsequent operation has been continuous and dependable. Estimates have been easily maintained without disruption of plant operation.

Phillips Improves Fabrication of Meter Manifolds 86

New orifice-meter manifold facilitates rapid field installation, reduces possibility of leakage, permits shipping with minimum chance of damage, and effects a saving in materials and assembly time. In addition, meter freezeups are reduced.

Two Years of Operating Unattended Pump Stations 87

By T. V. Bockman and R. S. Cannon

After 2 years' experience in operating five remotely controlled pump stations, Plantation Pipe Line Co. recommends three things: design for maximum safety, use the best equipment available, and coordinate electrical and mechanical maintenance. When these three steps are carefully worked out, unattended stations will be very satisfactory.

Effective Corrosion Control for Glycol Dehydration Unit 91

By Will Swerdloff and Maryann Duggan

A concentrated program for reducing corrosion on a glycol gas-dehydration unit has shown excellent results. Corrosion in all parts of the system has been effectively reduced. Test coupons and inspections are needed for complete evaluation. Continual attention must be given to the details of the program.

What It Costs to Test Formations in California 95

By C. P. Ball, Jr. and S. F. Fine

Emphasis should be placed on techniques which obtain information as drilling progresses. Exploring in long rat-hole intervals appears extremely costly and time consuming and recent improvements in testing equipment render it impractical.

Vapor Recovery Has Quick Payout 98

By Ed McGhee

Superior Oil Co. has vapor-recovery systems on three tank batteries in West Texas Diamond "M" field. All installations are paid out in 1 year or less.

How Good Is That Well Completion? 100

By C. L. Wilson, R. V. Smith, G. E. Henderson, and J. D. Stafford

The efficiency of well-completion methods can be readily evaluated by pressure-buildup tests. Procedures for taking these tests and a simple method of computing productivity ratios and skin effects are given here.

On-the-Job . . . Fields: Plastic Pipe Links Crude Gathering System 112

By R. T. Holtz

Nearly 2 miles of rigid polyvinyl chloride pipe was recently installed in Alluwe field 50 miles northeast of Tulsa. This is the first use of plastic pipe to handle crude oil in a water-flood system.

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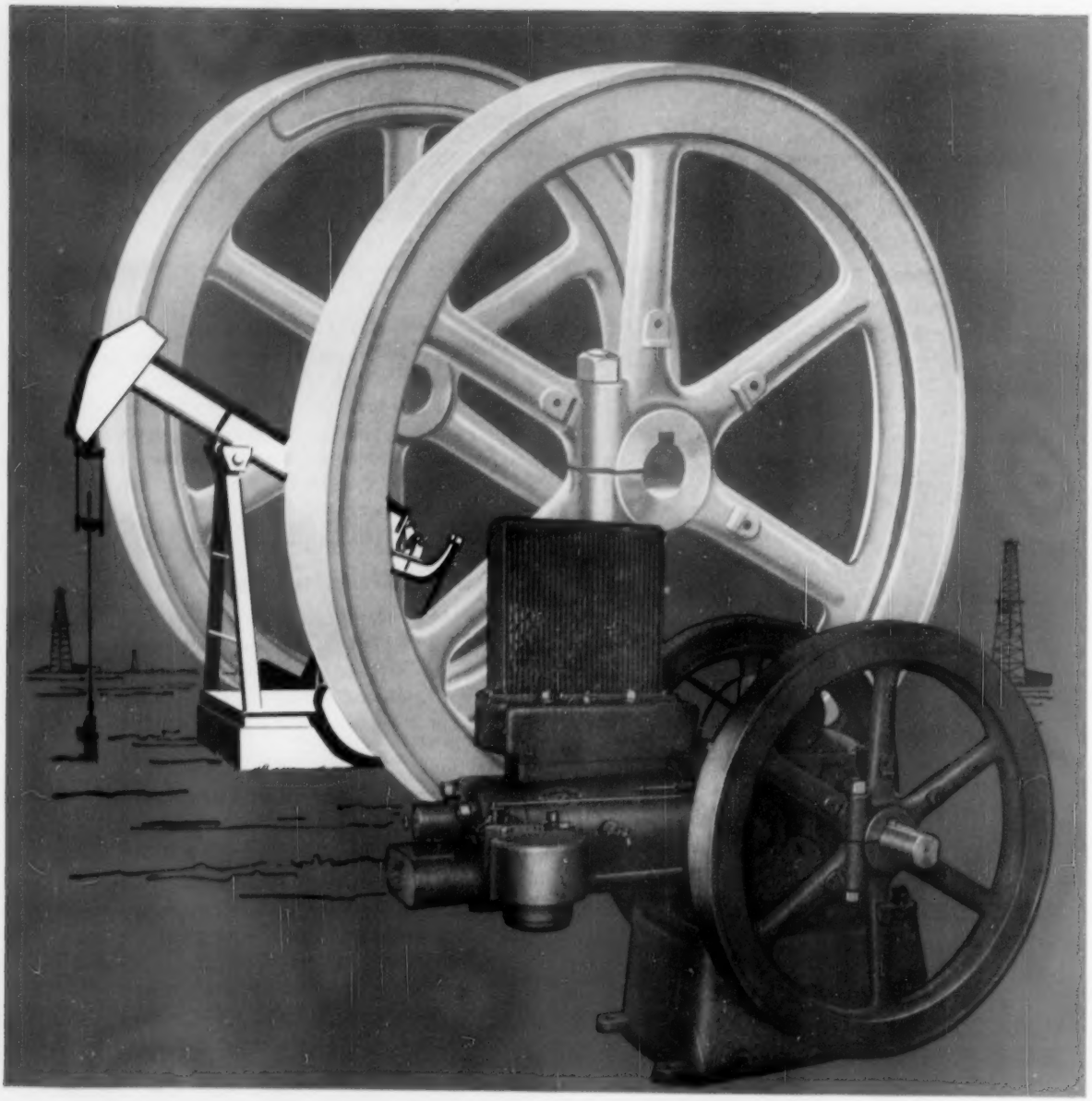

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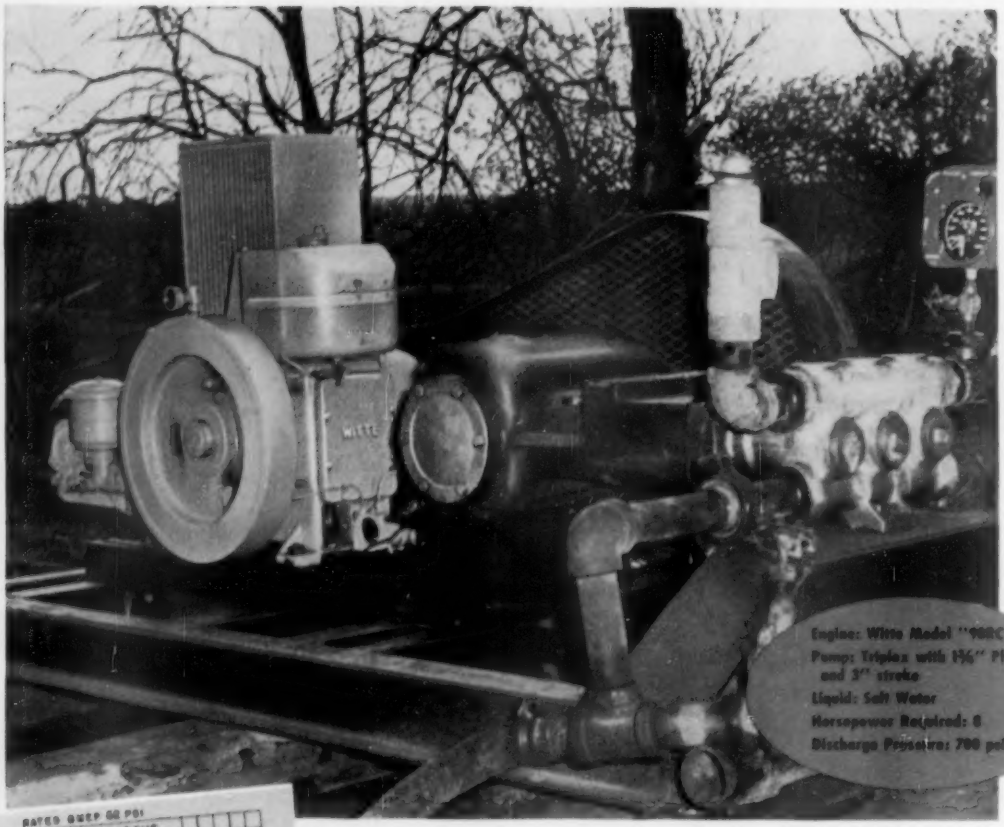
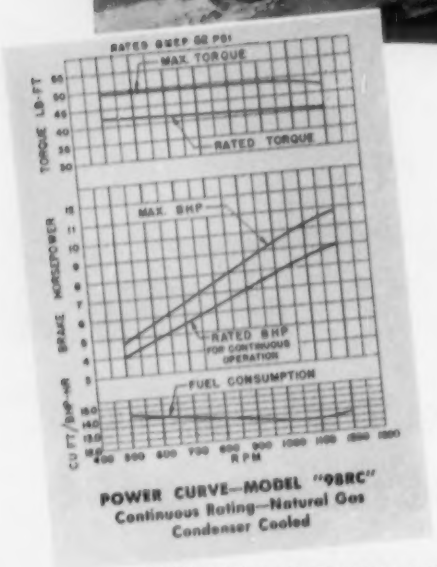
INDUSTRIAL PRODUCTS DIVISION


Engine: Witte Model "98RC"
Pump: Triplex with 1¾" Plungers and 3" stroke
Liquid: Salt Water
Horsepower Required: 8
Discharge Pressure: 700 psi



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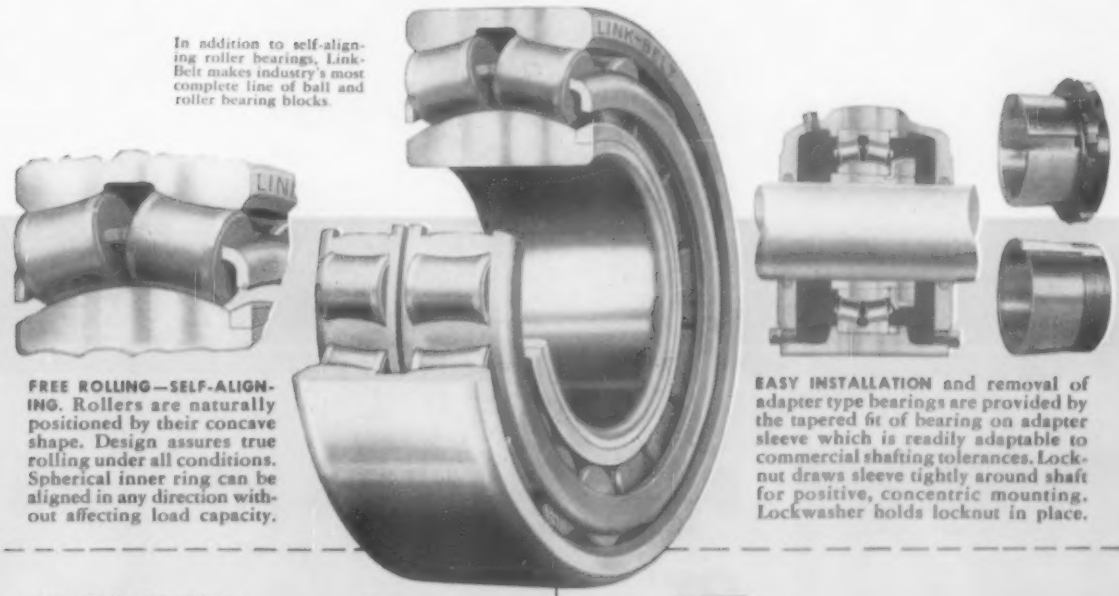
In addition to self-aligning roller bearings, Link-Belt makes industry's most complete line of ball and roller bearing blocks.



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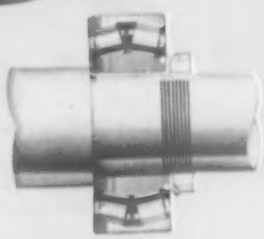

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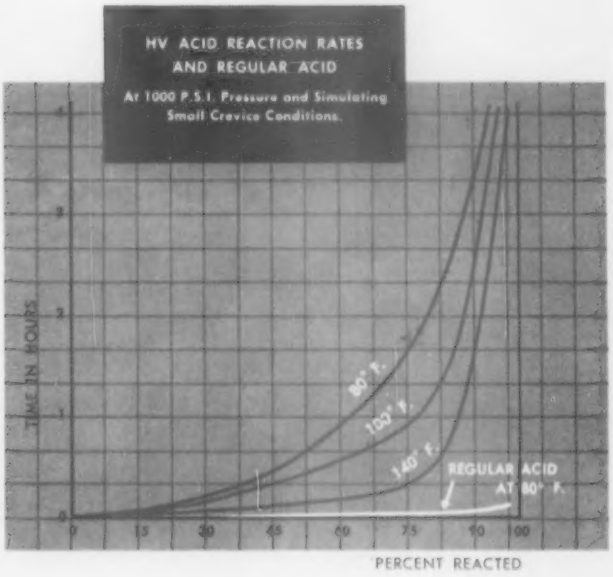

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Here's the new high viscosity mixture that puts a hydraulic brake on chemical reaction to give slower, more effective acidizing for retreatments and automatic selective treatments. HV Acid reaches *deep into untreated zones* by temporarily plugging oil permeable zones under low pressure pumping and diverting regular acids that follow into new flow channels. With HV Acid, one company increased production by retreatment in 28 out of 31 wells where previous attempts with ordinary acids were considered hopeless!

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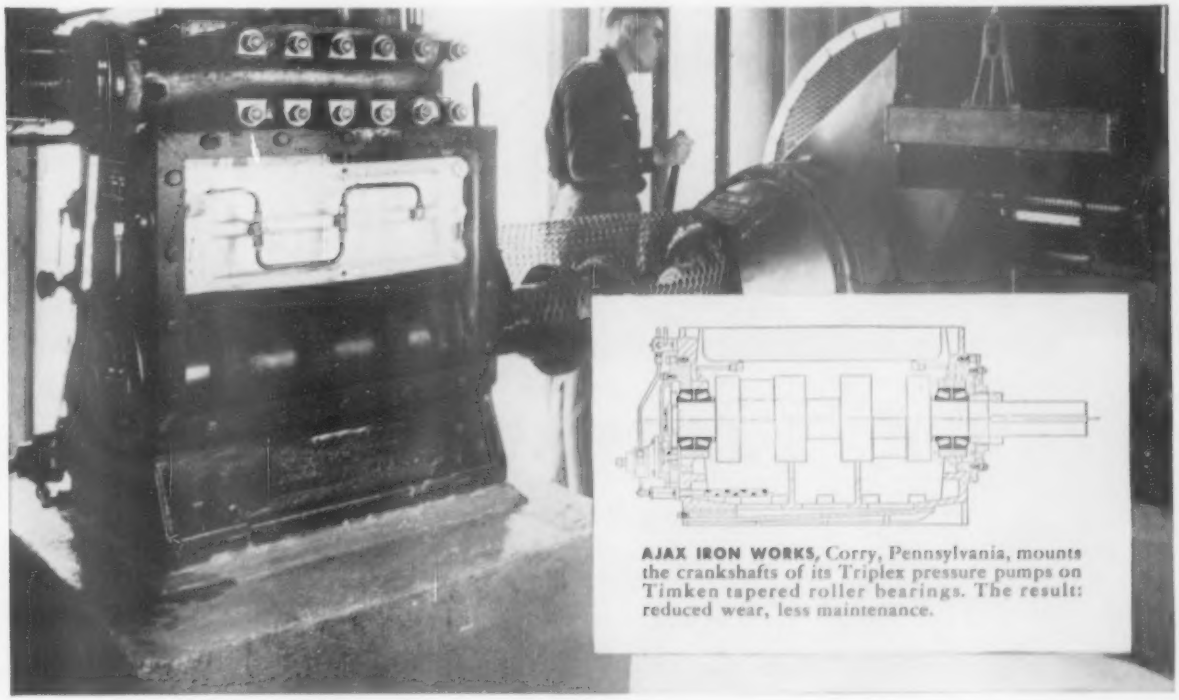
TIMKEN ROLLER BEARING EQUIPPED

This symbol on a product means its bearings are the best



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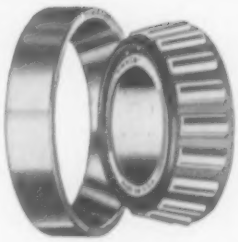

TIMKEN

TAPERED ROLLER BEARINGS

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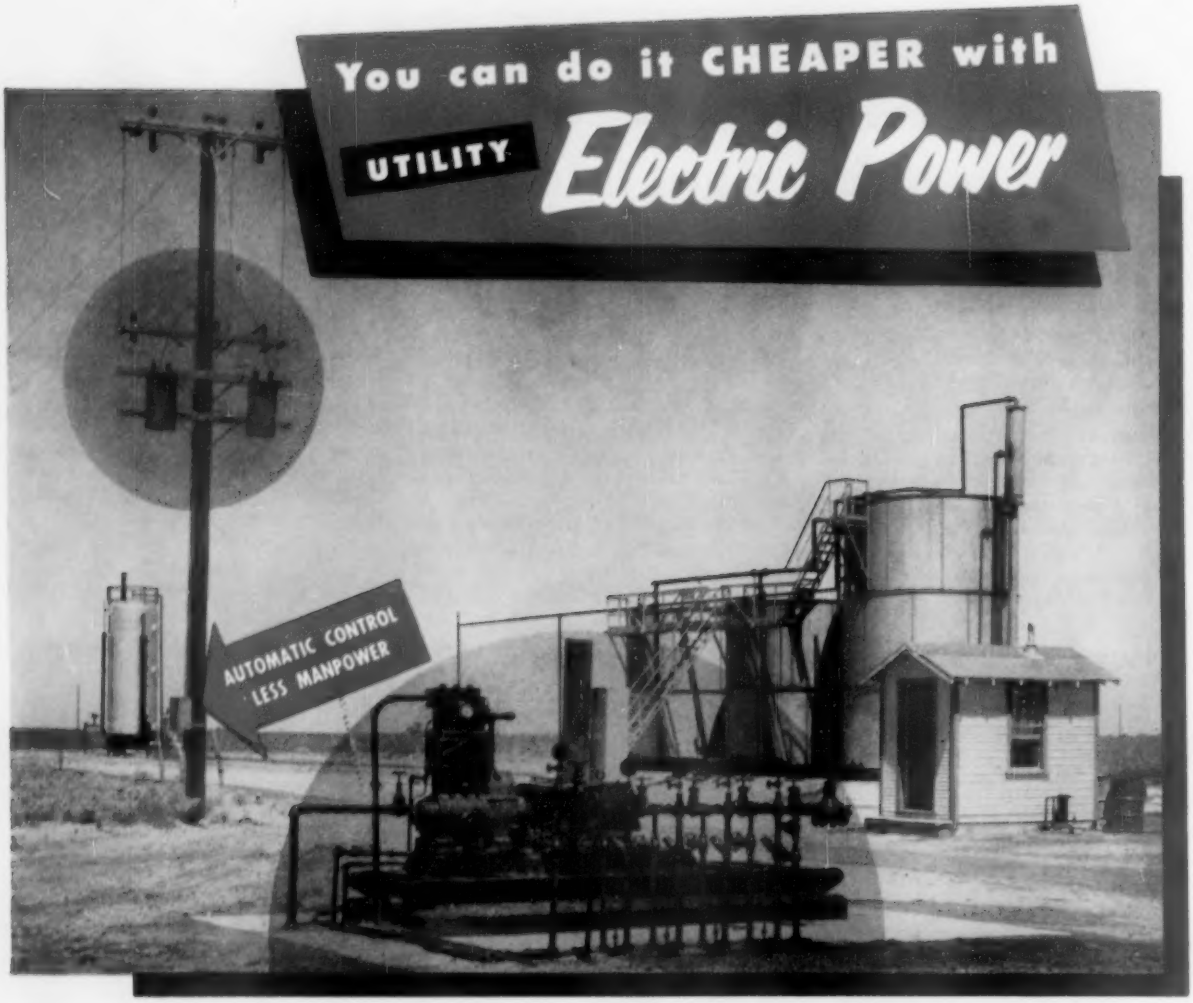

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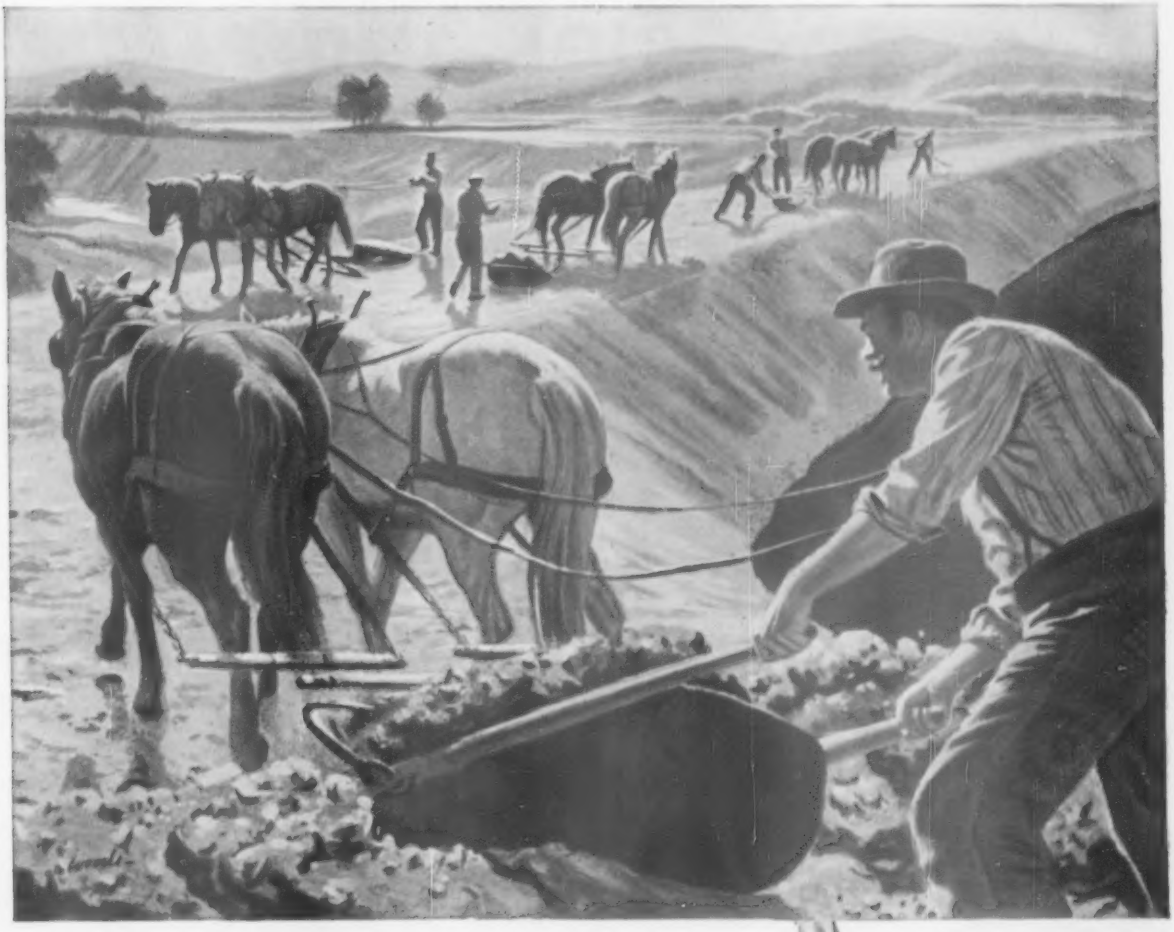


no match for MUSCLES OF STEEL

America's towering dams stand as mighty monuments to the efficiency of modern excavating and earth-moving equipment. On these machines, *muscles of steel*—rugged wire rope—handle with ease and dispatch the tasks that once were back-breaking for man and beast.

Wherever big construction projects are under way, you'll find Wickwire Rope at work—helping to do a better, faster and more efficient job.

Same way—in the mines and quarries ...in the oil fields and logging camps... with the fishing fleets and in materials handling. Here, too, Wickwire Rope has won outstanding preference because of its proved durability and demonstrated reliability and economy.

every industry benefits from wire rope

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

WICKWIRE ROPE A CF&I PRODUCT

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia

2696

IDECO
ONE OF THE DRESSER INDUSTRIES

RIGS AND PARTS*

RIG CAPACITIES
With 4½" Drill Pipe
A size and type for every depth — every job

16,000' to 20,000' — Model 1350-S, 1600-2400 HP input; torque converter drive.

15,000' — Model PR-1350, 1400 HP input; mechanical or fluid coupling drive.

14,000' — Model PR-1050, 1400 HP input; mechanical or fluid coupling drive.

12,000' — Model SUPER 7-11, 1200 HP input; torque converter, fluid coupling, or mechanical drive.

10,500' — Model 7-11, 1050 HP input; torque converter drive.

8,000' — Models H-750 and M-750, 750 HP input; torque converter, mechanical or fluid coupling drive.

7,000' — Model H-525, 525 HP input; torque converter drive.

6,000' — Model H-40, 400 HP input; torque converter drive; skid-mounted, or trailer-mounted as a Rambler Rig.

5,000' — Model H-35, 350 HP input; torque converter drive; skid-mounted, or trailer-mounted as a Rambler Rig.

4,500' and 3,300' — Models H-30 and H-25, 300 and 250 HP input; servicing depths 10,000' and 9,000'; torque converter drive; skid-mounted, or trailer-mounted as a Rambler Rig.

2,500' — Model H-20-B, 200 HP input; servicing depths to 7,500'; torque converter drive; skid-mounted, or trailer-mounted as a Rambler Rig.

3,000' — Model PR-150, 150 HP input; mechanical drive, air controls.

FOR DETAILED DESCRIPTIONS, SPECIFICATIONS, AND PERFORMANCE CHARACTERISTICS, GET YOUR COPY OF CATALOG NO. 54 FROM ANY J&L MAN.

Many a driller has promised himself that his next rig will be an IDECO. There are two reasons for this industry-wide trend.

First, every man has a natural desire to own the finest equipment money will buy, and these rigs are world-famous.

Second, J&L maintains IDECO parts stocks at centrally located points, ready for immediate delivery to any field in the United States and Canada.

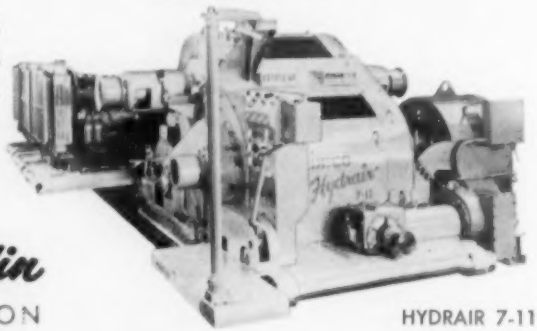
What is an IDECO HYDRAIR HOIST?

IDECO *Hydrair* hoists combine a *hydraulic* torque converter drive with *air* clutch and *air* controls

IDECO Power Rigs have a mechanical or fluid-coupling drive. However, like the Hydrair rig, there are air controls and air clutches. Mechanical drives are available with the PR-1350, PR-1050, SUPER 7-11, M-750 and PR-150.

*** Where J&L stocks IDECO Parts**

Casper, Wyoming
Great Bend, Kansas
Oklahoma City, Oklahoma
Shreveport, Louisiana
Corpus Christi, Texas
Wichita Falls, Texas
Houma, Louisiana
Hobbs, New Mexico
Edmonton, Canada



HYDRAIR 7-11

J&L STEEL

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION — TULSA, OKLAHOMA
Serving The United States and Canada

109-M

The most valuable mud additive is yours for the asking:

Baroid's EXPERIENCE

Any way you look at it, you get better mud engineering service from Baroid. No other mud company can match Baroid's experience:

- More than *180,000 rotary-drilled wells* have been serviced by Baroid engineers.
- More than *three-quarters of a million* well mud tests have been made by Baroid.
- Your Baroid engineer is backed by more than *two thousand four hundred man-years* of field engineering experience.

This experience is your assurance that a Baroid-planned mud program will help you drill faster, more economically, and with less trouble. Since mud engineering began, Baroid has had qualified engineers servicing wells just like yours. Get the full benefit of this accumulated ability now. Specify Baroid products on your wells.

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Please send me all of the latest Baroid mud engineering technical bulletins as issued.

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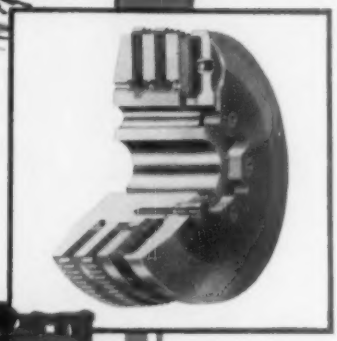
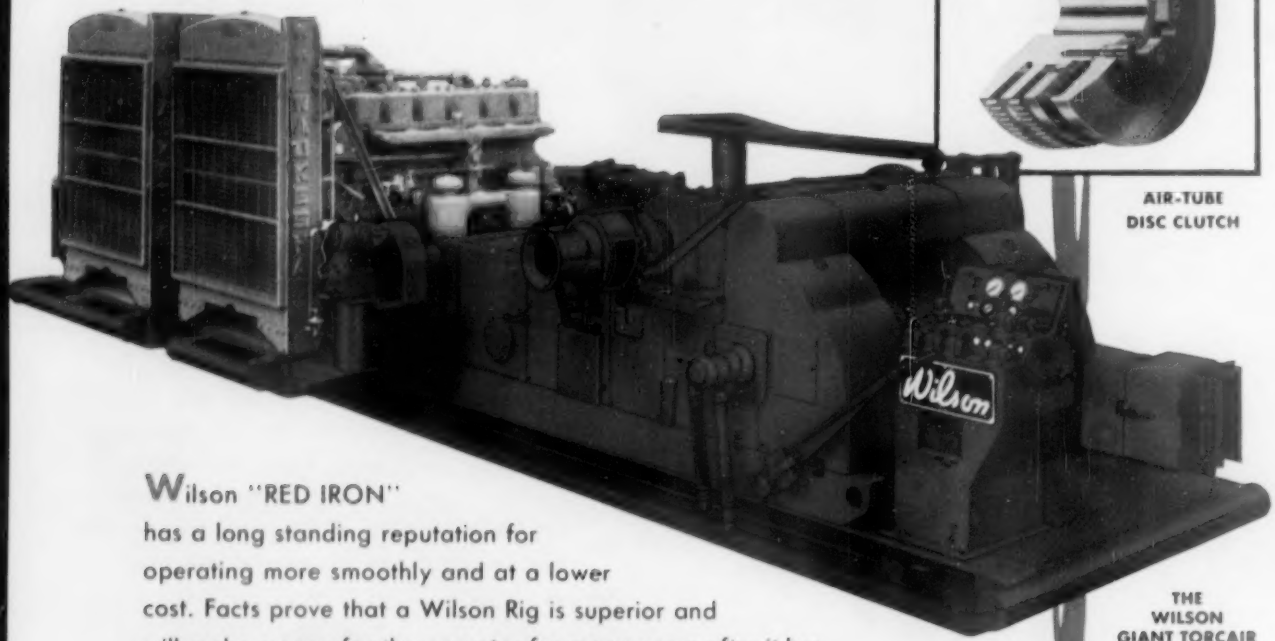
"RED IRON" Eliminates Black Disposition

BE MODERN — BUY WILSON!



AIR-TUBE
DISC CLUTCH



THE
WILSON
GIANT TORCAIR
OR
ROADAIR
RIG

Wilson "RED IRON"
has a long standing reputation for
operating more smoothly and at a lower
cost. Facts prove that a Wilson Rig is superior and
will make money for the operator for many years after it has
paid for itself. This Giant Roadair Rig is just one of the many Wilson Rigs which you will find MORE DEPENDABLE, MORE ECONOMICAL and MORE RUGGEDLY BUILT! You can be sure that you're YEARS AHEAD . . . So BE MODERN, BUY WILSON!

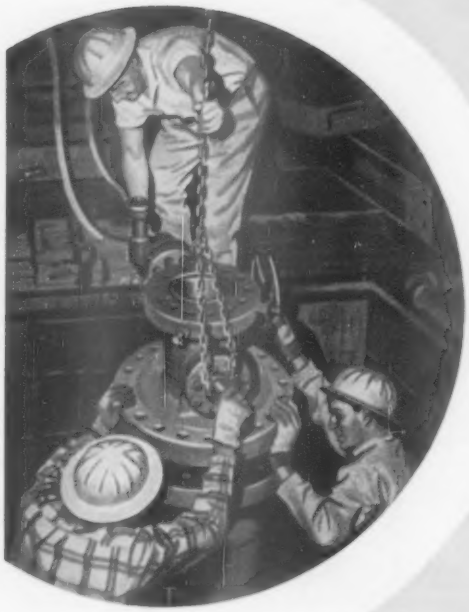
The FIRST NAME in DRILLING RIGS!

Wilson

WILSON MANUFACTURING CO., Inc.

The Home of RED IRON • Wichita Falls, Texas, U.S.A.

Service Unlimited



One of the men in this cellar is an O-C-T Service Man. Only a few hours earlier, he had been alerted for the job and he made it his business to get there without delay.

During the drilling and completion operations on every well, there comes a time when good service from your equipment supplier can save you money.

We can only guess how many thousands of dollars have been saved for the oil industry by prompt O-C-T service. But we do know this: Oil Center Tool Company maintains the largest service organization in the field to help you set and service wellhead assemblies.

It makes a good combination you can count on . . . the most dependable equipment plus the best service in the field.

OIL CENTER TOOL COMPANY WAREHOUSE AND SERVICE POINTS

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McAllen, Texas
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Williston, N. D.
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Alberta, Canada
Edmonton,
Alberta, Canada
Maracaibo, Venezuela
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O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oiltools, C. A. Del Lago Hotel, Maracaibo, Venezuela. Address Export inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

KERMAC
The Right Men and Equipment for any Drilling Job...
ON LAND AND AT SEA
KERR-McGEE
OIL INDUSTRIES, INC.
General Offices • Oklahoma City
KERMAC

Spang fights drill pipe and tubing corrosion

WITH 16 COATS OF PLASTIC

The corrosion that causes many costly drill pipe and tubing failures is now meeting its toughest opponent—SPANG plastic-coating. At our Seamless Mill we've developed the industry's most modern equipment to protect the interior of drill pipe and tubing with 16 uniform coats of tough plastic.

Like all manufacturing operations behind SPANG Tubular Products, it's a precisely-controlled process. First the pipe is carefully cleaned and pre-heated. Next special spray lances, each with a 360-degree spray head, are passed through the pipe at a speed of one foot per second. They give it two coats in one complete pass, and then the plastic is baked on in furnaces. The exposed areas of the tubing couplings or joints are similarly coated and baked.

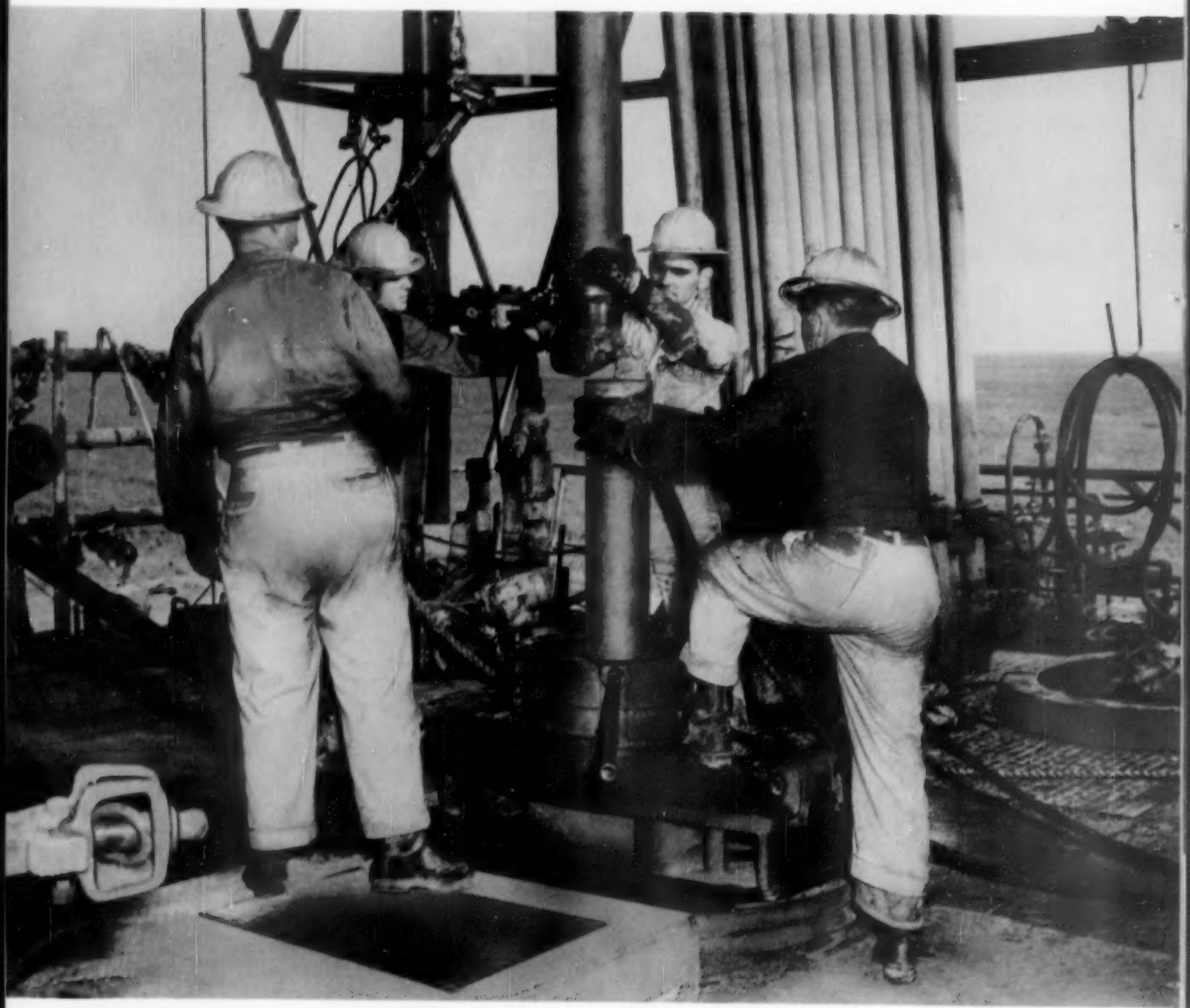
Alternate spraying and baking continue until the pipe has 16 coats. Finally, to insure uniform quality, random samples from every finished lot are thoroughly checked for coating thickness, smoothness, adhesion and completeness of baking.

It took ten years of thorough research and experimentation to perfect this precision process. For example, the plastic finally used was chosen after extensive tests of 54 different formulas. But the results amply justify the research.

Operators can now buy a superior, factory-applied plastic coating, and be assured of the same quality control that's behind all of SPANG's oilfield tubular products. They can also save time and money through the extra "insurance" SPANG plastic-coating provides against drill pipe and tubing corrosion—and against paraffin deposits in tubing and gathering lines. Whatever it takes to make possible such benefits, operators just naturally expect the best—in products as well as supply service—from National Supply.

THE
NATIONAL SUPPLY
COMPANY

It's fast work with Spang Extreme Line Casing!



Drilling crews like to work with SPANG Extreme Line Casing because it's easy to handle. When they're running-in, only 5 to 7 turns with the spinning line and less than one turn with the tongs are necessary. It's very easy to stab, *cannot* be cross-threaded, and its positive shoulder contact engagement prevents overtonging. But there are more good reasons.

The streamlined interior and exterior contours of this high quality casing provide for maximum running efficiency—no shoulders to hang-up on hole projections, or to scrape mud seal from the walls of the hole. SPANG's high strength integral joint provides a minimum of threaded connections—and this means fast action.

Precision-manufactured SPANG Extreme Line Casing pays off *in* the well, too. It has the mechanical and metallurgical properties to withstand high tensile loading, and to resist the severe pressures found in present-day deep drilling. Its rugged integral joint is 100% leak-resistant—a highly important factor in deep, high-pressure wells. Another outstanding fact is that SPANG Extreme Line Casing can be salvaged and re-run repeatedly.

You can easily get more information about this quality casing *in terms of your specific needs* by calling the nearest office listed at the right, or asking the National Supply representative in your area. Find out soon how SPANG Extreme Line Casing can save you money in the long run.

for every well condition

SPANG®

EXTREME LINE* *Casing*

is available in

Grade **J-55**
55,000 psi minimum yield strength

Grade **N-80**
80,000 psi minimum yield strength

Grade **P-110**
110,000 psi minimum yield strength

THE **NATIONAL SUPPLY** COMPANY

SPANG-CHALFANT DIVISION
MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Ft. Worth, Texas; Los Angeles, California; Toledo, Ohio; Tulsa, Oklahoma; Calgary, Alberta, Canada
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

There's another important Spang tubular product on the next page...

for low pressure refining lines...

sub-surface hydraulic pumping...

Wherever you need steel pipe

YOU'LL PROFIT WITH QUALITY

These are just a few of the many oilfield applications in which SPANG CW Steel Pipe has consistently proved its quality and dependability. Here's why it pays off *wherever* you put it to work:

Like all the other famous SPANG oilfield tubular products, SPANG CW is made under close quality control conditions. This manufacturing care behind SPANG CW insures strong, uniform welds and uniform diameters—makes it easy to work with and install. Thorough tests and inspections before shipping also insure its top strength and long service life—features that are profitable on every installation.

SPANG CW costs no more than pipe produced under less exacting conditions, so why not try it on your next job? You'll find it available at all National Supply Stores.

SPANG®

CW

SPANG-CHALFANT DIVISION

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.

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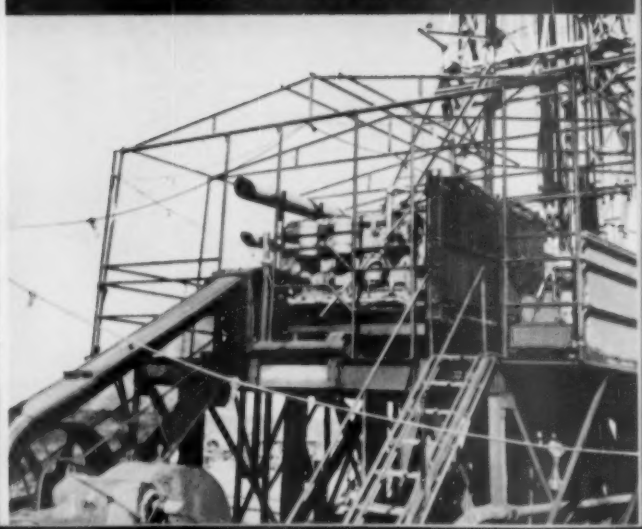
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

THE
NATIONAL SUPPLY
COMPANY

water flooding...

roof rails and exhaust line...



MARVEL INVERSE OILER—

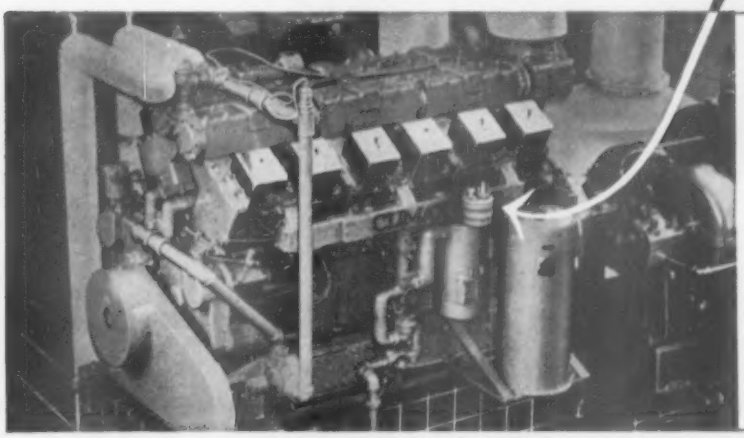
Vital Part of World's Finest Engines

Engine manufacturers think so highly of the Marvel Inverse Oiler they have incorporated it as a vital unit in their engines' lubrication systems.

They have found that engines, equipped with Marvel Inverse Oilers, can be depended upon to give quick acceleration to save trip time . . . keep operating costs to a minimum . . . guarantee hours of continuous performance . . . keep "down-time" low by extending periods between overhauls.

The famous Climax Engines, one of which is pictured below, is an example. A truly fine performer, it is equipped with a Marvel Inverse Oiler for Marvel Mystery Oil—finest performing lubricant of all.

The Marvel Inverse Oiler feeds Marvel Mystery Oil in exact proportion to engine speed and load . . . properly lubricating valves and guides, preventing wear and sticking. Keeps upper piston rings free in their grooves . . . retards ring flutter . . . and cushions ring pounding which can result in ring breakages. Remember, it is the *oil* which must do these things and only Marvel Mystery Oil is blended for this purpose and for this oiler.



The Marvel Inverse Oiler

is an integral part of the Climax 12 cylinder, 171 H.P., 600 RPM GAS ENGINE. Operating off the intake manifold, this completely automatic Oiler feeds Marvel Mystery Oil exactly in proportion to engine loads . . . gives direct protection to the all-important upper cylinder areas.

This Chart shows the proper setting for constant load engines

BRAKE H. P. AT BELT	NAT. GAS CU. FT. PER HOUR	BUTANE GALLONS PER HOUR	GASOLINE GALLONS PER HOUR	M. M. OIL DROPS PER MIN.	M. M. OIL HOURS PER QUART
10	115.	1.07	1.12	4	228
15	172.5	1.60	1.68	6	152
20	230.	2.14	2.24	8	114
25	287.5	2.67	2.80	10	91
30	345.	3.21	3.36	12	76
35	402.5	3.74	3.92	14	65
40	460.	4.28	4.48	16	57
45	517.5	4.81	5.04	18	50
50	575.	5.35	5.60	20	46
60	690.	6.42	6.72	24	38
70	805.	7.49	7.84	28	32
80	920.	8.56	8.96	32	28
90	1035.	9.63	10.08	36	25
100	1150.	10.70	11.20	40	22
120	1380.	12.84	13.44	48	19
140	1610.	14.98	15.68	56	17
160	1840.	17.12	17.92	64	14
180	2070.	19.26	20.16	72	12
200	2300.	21.40	22.40	80	11
225	2587.5	24.00	25.20	90	10
250	2875.	26.75	28.00	100	8
275	3162.5	29.42	31.10	110	6
300	3450.	32.10	33.60	120	7

Chart shows total oil consumption

EXAMPLE:—If you use 805 cu. ft. of dry gas, 7.49 gallons of butane or 7.84 gallons of gasoline, your H.P. is about 70, so adjust oiler to feed 28 drops per minute. You will then receive about 32 hours per quart of MARVEL MYSTERY OIL.

If engine load increases after setting for normal load, oiler will automatically increase its feed, decreasing when load is lessened.

To determine drop count per oiler when more than one is used on an engine—divide recommended drop count by number of oilers.

NOTE: Guarantee on oiler is void if any other oil than MARVEL MYSTERY OIL is used. Some *engines* also carry this guarantee policy.

See Your Local Jobber or Oil Well Supply House

EMEROL MFG. CO.

Dept. 370, 242 West 69th Street New York 23, N. Y.

Here's Why: **Hydromatic automatically goes into action the very instant load starts down. It does this without adjustment or manual operation. It requires no outside power or equipment. Braking power—provided by constant water supply—increases automatically with any tendency of load to increase speed. When installed with overrunning clutch, Hydromatic engages instantly and automatically with first downward movement—disengages when load starts up. This dependable power will lower the longest string smoothly and safely—will save you countless hours and dollars on round trips. Since there is but one moving part to the ingenious Hydromatic, maintenance is rarely ever required.**

With all this ease and dependability Hydromatic Brakes actually cost less to install, less to operate. What more do you want from a brake?

• ***There's a Hydromatic for every size rig. Contact your Parkersburg Representative or write today for Catalog HB-1-52.***

Parkersburg
RIG AND REEL COMPANY
DIVISION OF PARKERSBURG : AETNA CORPORATION

3345 WINTHROP AVENUE
FORT WORTH 16, TEXAS

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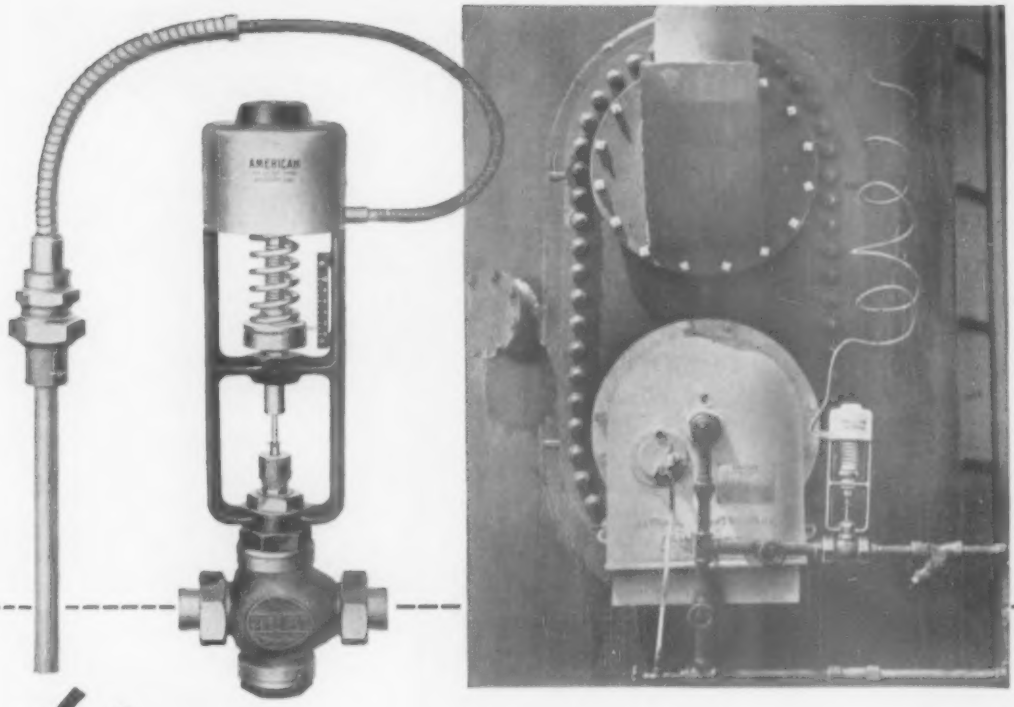


You SELECT THE TEMPERATURE...

the American Temperature Regulator maintains it constantly

Your convenience is suited by the ease with which you can select and maintain required temperatures when you use American Temperature Regulators. The sensitivity and responsiveness built into these fine products through long years of engineering and manufacturing experience combine to assure accuracy of temperature control.

Day after day, these compact, easy-to-install and durable regulators provide dollar savings by maintaining temperature within required limits. Securely housed in indoor plants or withstanding the elements in field installations, American Temperature Regulators serve industry dependably wherever temperature control means dollar savings.

Among the many applications where American Temperature Regulators are giving good account of themselves daily are crude oil heaters and treaters and other process equipment; hot water tanks and diesel water jackets; feedwater systems and air compressor after coolers.

Installation, temperature adjustment and repeat setting are easy. Sizes range from ¼" to 4". Protective armor safeguards the capillary tubing and a heavy steel cap protects the seamless bellows, against damage. A safety spring protects the bellows from damage caused by accidental overheating of the bulb.

Increase efficiency and cut costs—get constant, safe, dependable temperature control of oil, water, steam, and other media. Put the rugged American Temperature Regulator to work for you 24 hours a day. Complete information is yours on request. Write for Bulletin 112.

YOUR INDUSTRIAL SUPPLY DISTRIBUTOR is as close as your telephone. Buy conveniently and economically—call on him for expert counsel and prompt delivery from local stocks.

1850 AMERICAN U S A

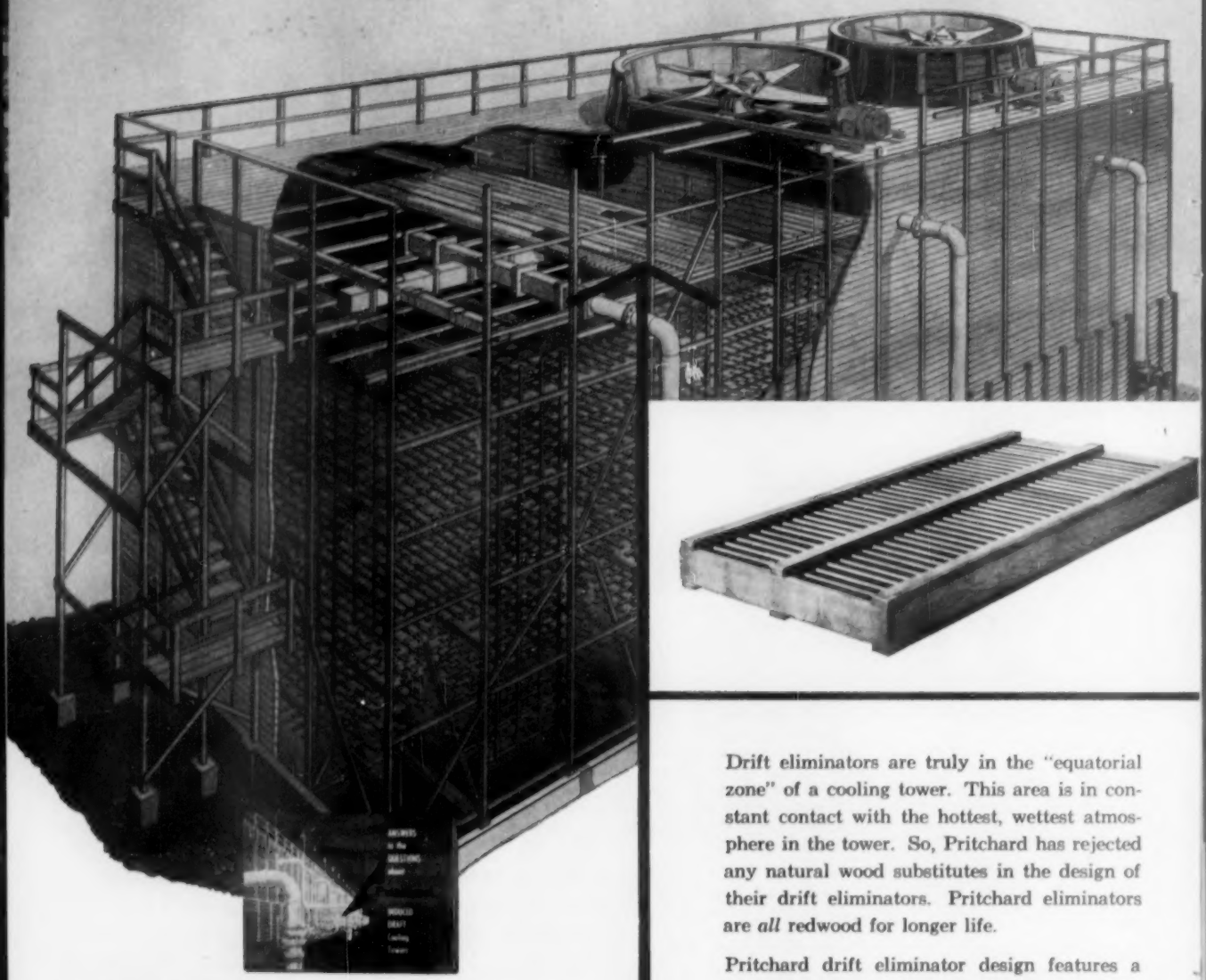
AMERICAN INDUSTRIAL INSTRUMENTS

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

MAKERS OF "AMERICAN" AND "AMERICAN-MICROSEN" INDUSTRIAL INSTRUMENTS, "HANCOCK" VALVES, "ASHCROFT" GAUGES, "CONSOLIDATED" SAFETY AND RELIEF VALVES, AIRCRAFT PRODUCTS. BUILDERS OF "SHAW-BOX" AND "LOAD LIFTER" CRANES, "BUDGIT" AND "LOAD LIFTER" HOISTS AND OTHER LIFTING SPECIALTIES.

ONE MORE REASON TO CHOOSE PRITCHARD COOLING TOWERS:

GREATER STRENGTH AND RIGIDITY FOR THE "EQUATORIAL ZONE"!



Drift eliminators are truly in the "equatorial zone" of a cooling tower. This area is in constant contact with the hottest, wettest atmosphere in the tower. So, Pritchard has rejected any natural wood substitutes in the design of their drift eliminators. Pritchard eliminators are *all* redwood for longer life.

Pritchard drift eliminator design features a rigid framework. Surfaces that reduce drift loss are in a constant position for high drift recovery. Yet, blades, carried in slots, can expand and contract freely.

Pritchard ships the 3′ x 6′ drift eliminator sections completely assembled even when the customer provides field labor.

And Pritchard drift eliminators cover the entire plan area of the tower *above* the distribution system resulting in better air flow pattern and superior performance. How superior? A guaranteed drift loss of less than 0.2% of water circulated!

GET ALL THE FACTS! Get your complimentary copy of the new Pritchard brochure "Answers to the 15 Questions about Pritchard Induced Draft Cooling Towers." Fascinating reading to anyone interested in cooling towers. Completely illustrated. Full of tips on evaluating cooling tower bids, factors in choosing towers. Your complimentary copy awaits—write for it today on your company letterhead!

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COOLING TOWERS
GAS & AIR TREATING EQUIPMENT

REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

J.F. Pritchard & Co.
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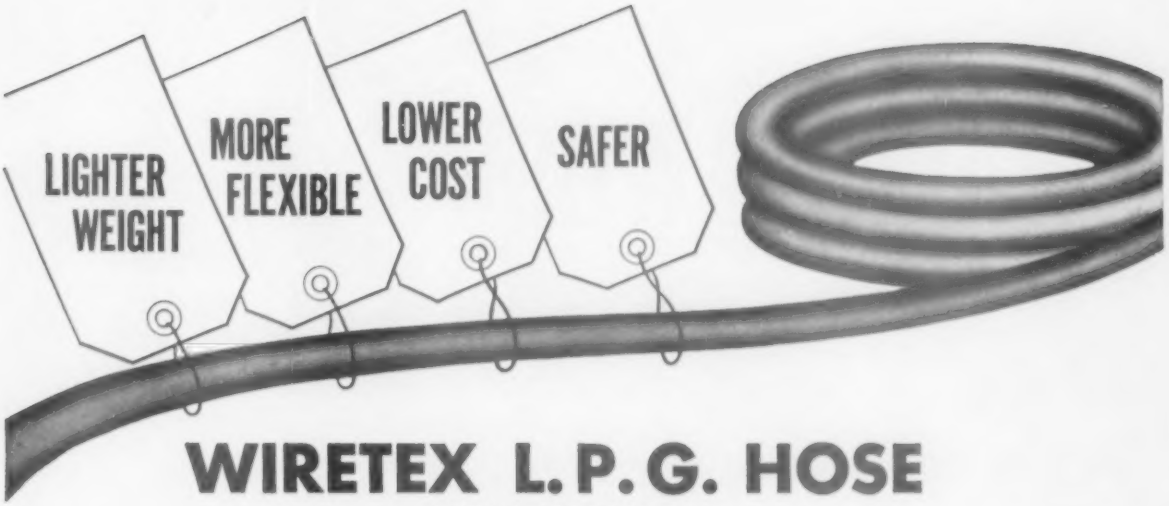
Dept. 502, 4625 Roanoke Parkway, Kansas City 12, Mo.



WIRETEX L.P.G. HOSE

BUTANE-PROPANE

LIGHTER WEIGHT— lighter by 28% than fabric reinforced hose in the popular ¾" size.

MORE FLEXIBLE— because of its wire-braid construction; easier to handle, too—in all sizes!

LOWER COST— than fabric reinforced hose.

WIRETEX L.P.G. Hose has built-in safety factor in the strength of the steel wire-braid reinforcement. For further safety, there are two static-dissipating wires spiralled into the textile braid, which forms a bond between the reinforcement and the cover.

The Reprene tube is especially compounded to handle liquid butane and propane which would be destructive to ordinary rubber. The abrasion-resisting rubber cover is colored RED for easy identification. WIRETEX L.P.G. Hose is your most economical conductor of liquid petroleum gas.

Your local Republic Distributor can help you plan, select, apply and maintain any product of Industrial Rubber. If his name is not listed in the yellow section of your telephone directory, write us for his name and address.

WIRETEX L. P. G. HOSE is available in lengths up to 60' in a full range of sizes from ½" to 2" inclusive.

SPECIFICATIONS

Spec. Number	Size I.D.	Wire Braid	Approx. O.D.	Approx. Wt. Lbs. Per 100'	Max. Wkg. Pressure Pounds	Std. Pkg. Qt.
W-63-50	½"	1	¹¹⁄₁₆"	37#	350#	240'
W-63-75	¾"	1	1 ³⁄₃₂"	53#	350#	240'
W-63-100	1 "	1	1½"	72#	350#	240'
W-63-125	1¼"	1	1 ¹³⁄₁₆"	105#	350#	120'
W-63-150	1½"	1	2 ¹⁄₁₆"	135#	350#	120'
W-63-200	2 "	1	2⅜"	170#	350#	60'

"Quality Hose Builders for Over 50 Years"

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

AIR AT WORK

New two-stage Ro-Flo compressor provides constant efficiency... cuts maintenance

Efficiency and air supply are constant year after year with *Ro-Flo* compressors. Even if wear occurs, it is automatically compensated for, so that air supply is unaffected.

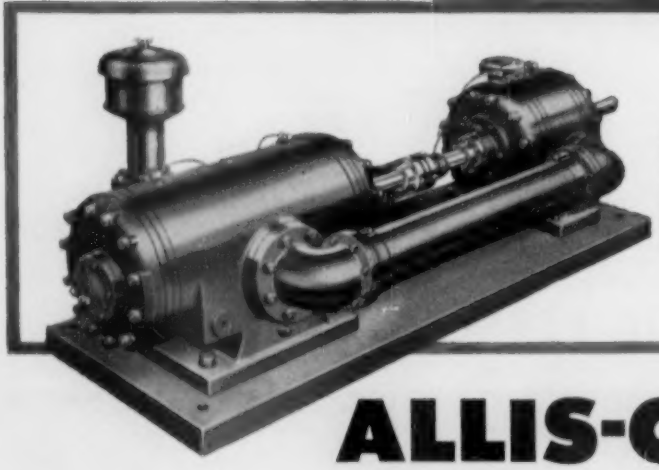
In addition, rotary design eliminates practically all vibration. No heavy foundations are needed.

Maintenance is cut too! There is no wear and tear from shock and vibration . . . no hard-to-maintain pistons and valves.

For constant efficiency . . . overall savings on air, modernize air supply with two-stage *Ro-Flo* compressors.

GET THE FACTS: Contact your A-C office or write Allis-Chalmers, Milwaukee 1, Wis.

Ro-Flo is an Allis-Chalmers trademark.



Two-stage *Ro-Flo* compressors in pressures from 60 to 125 pounds gauge, and volumes from 250 to 1800 cubic feet per minute. Single-stage units for lower pressures.

A-C ALLIS-CHALMERS

A 4738

ALLIS-CHALMERS

Unibestos® keeps 1175° where it belongs

Catalytic cracker...vacuum still and "poly" plant—all get added protection against heat loss with strong, single-layer Unibestos Pipe Insulation.

And Unibestos starts cutting costs right at the beginning. Unibestos, made of African Amosite, is easy to handle, easy to cut and miter. Long, interlacing fibers assure positive heat seals between sections...reduce pointing of joints...simplify insulation of fittings.

Built to resist thermal shock, vibration, and unaffected by most acid and chemical fumes, Unibestos can be easily removed and effectively reapplied when lines are relocated or replaced.

Standard Production Sizes

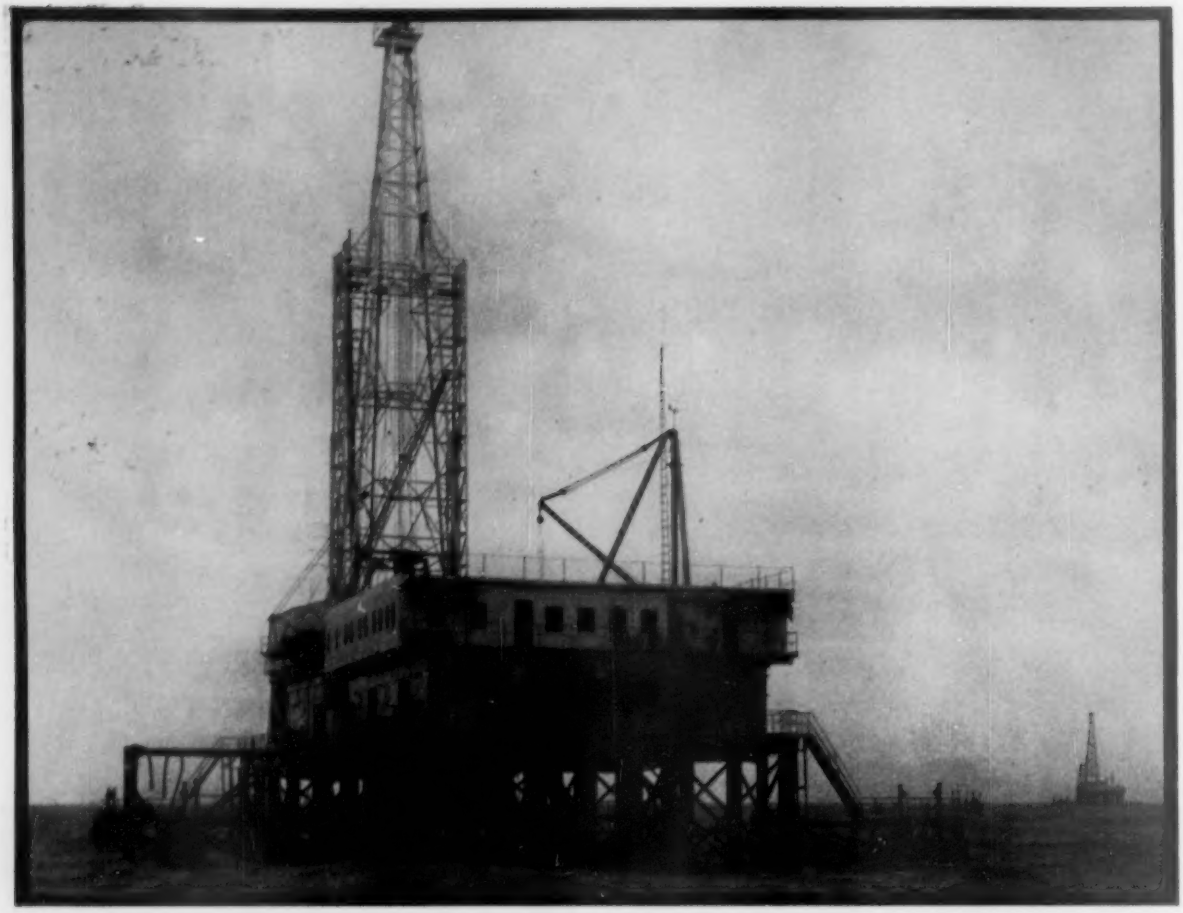
Unibestos Pipe Insulation is regularly made in 3-foot lengths for pipe sizes from ½" through 24", in standard thicknesses through 5". Unibestos Block Insulation is made in 6", 12", 18" or 36" widths and in thicknesses from 1" through 3" in ½" increments.

For complete information, write for descriptive Bulletin 109C

UNARCO®

UNION ASBESTOS & RUBBER COMPANY

1111 West Perry Street • Bloomington, Illinois



ALEXANDER COMPLETES NO. 2 FOR ODECO
JOHN HAYWARD JOINS MR. CHARLIE IN GULF

Alexander Shipyard continues its pace-setting activity in deep-water drilling design and construction by completing Odeco's second offshore drilling giant, the John Hayward. Alexander's first barge for Odeco was the much heralded Mr. Charlie, (pictured in background) after which the John Hayward was patterned.

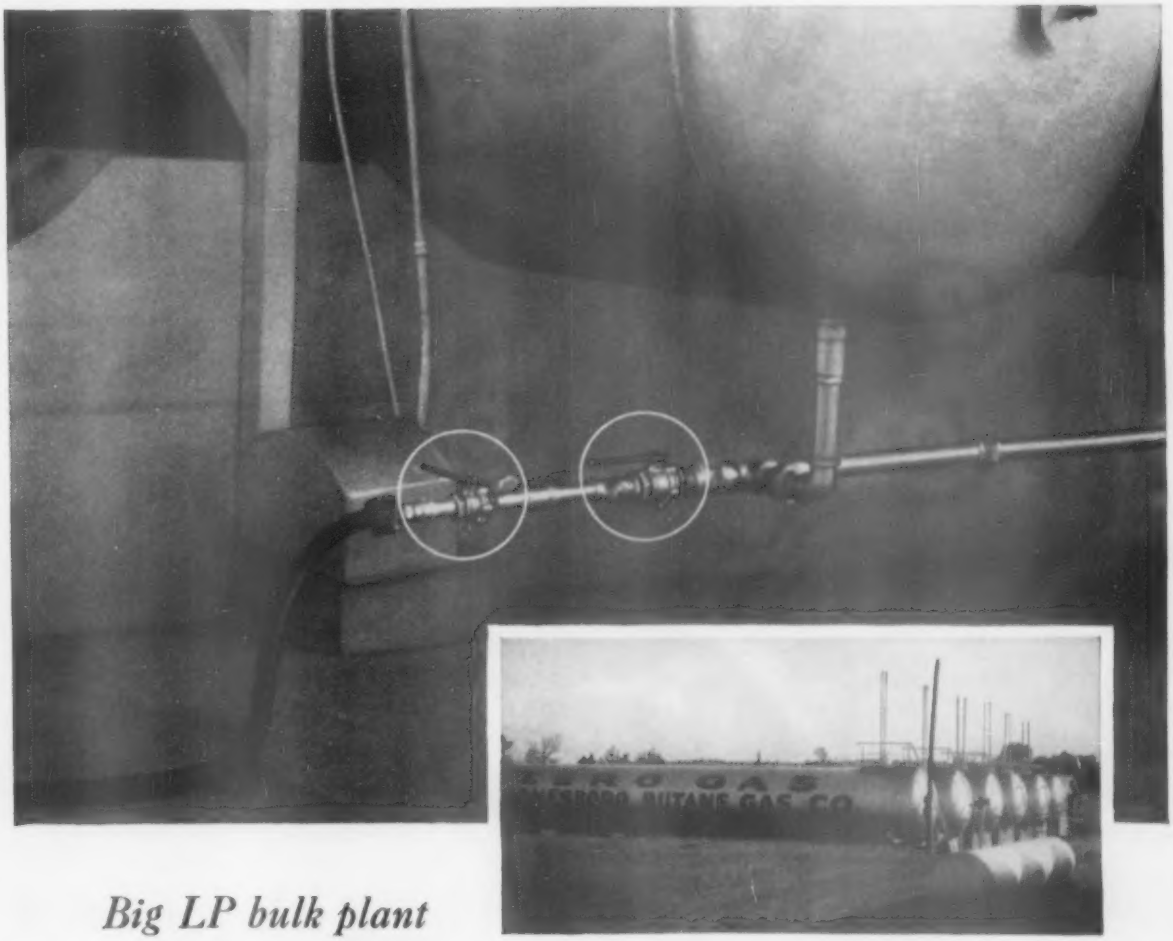
The submersible barge is 180′ x 60′ x 10′ with an overall height of 74′ from the bottom of the hull to the top of the helicopter deck. Its drilling capacity is 18,000 feet in 30 feet of water and it comfortably accomodates 40 men in air-conditioned quarters.

Alexander Shipyard's outstanding design and construction facilities are available for large and small jobs alike. If your concern is planning a marine project, contact Alexander Shipyard.

ALEXANDER *Shipyard* INC.

P.O. Box 8126, New Orleans, La. • Valley 2408

PIONEERS IN OFFSHORE DESIGN AND CONSTRUCTION



Big LP bulk plant safeguards loading lines with full round flow Rockwood Ball Valves

Conventional valves on the loading lines were causing a delay at this busy bulk plant. Hoses burst, due to expansion of the liquid by the morning sun, and leakage was a problem.

Rockwood Ball Valves ended these annoyances. Since their installation not a hose has been lost — and their extra fast opening and closing, plus elimination of leakage, have brought new speed and safety to loading operations.

There are four good reasons why Rockwood Ball Valves are such outstanding performers — four exclusive features for trouble-free efficiency:

Full Round Flow — no change in shape or volume of fluid stream — no turbulence.

Quick Opening and Closing — only a quarter turn needed, even under full pressure — a time saver.

Longer Wear Resistance — chrome-plated bronze ball withstands abrasion, pitting and scratching.

Leakproof Seal — pressure of fluid automatically positions ball against seat to form tight seal. Retainer spring holds ball tight on seat at no pressure.

If you are not now using Rockwood Ball Valves, send coupon today for complete information. Valves come in all pipe sizes — ⅛" to 2½" in bronze — 3" to 8" in steel. Tested and listed by Underwriters' Laboratories, Inc. Ask for Rockwood air-operated ball valves for remote control use. Distributors in all principal industrial areas.

ROCKWOOD BALL VALVES

FULL, ROUND FLOW

ROCKWOOD SPRINKLER COMPANY
526 Harlow Street
Worcester 5, Mass.

Send me illustrated folder V-4 on Rockwood Full-Flow Ball Valves.

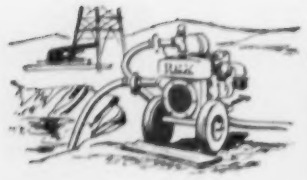
Name.....

Title.....

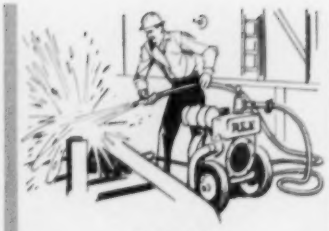
Company.....

City.....

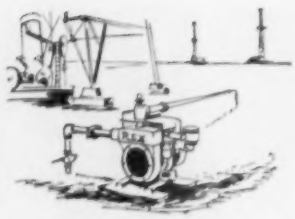
Zone.....*State*.....



Salvaging oil from slush pits

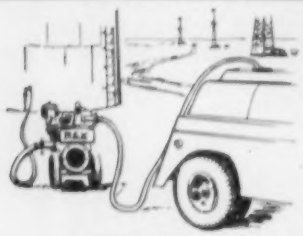


Rig wash-down

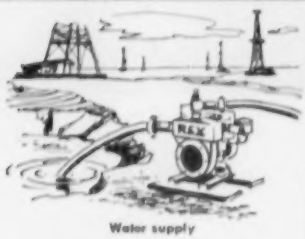


Permanent transfer installations

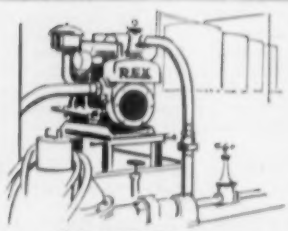
Fire protection



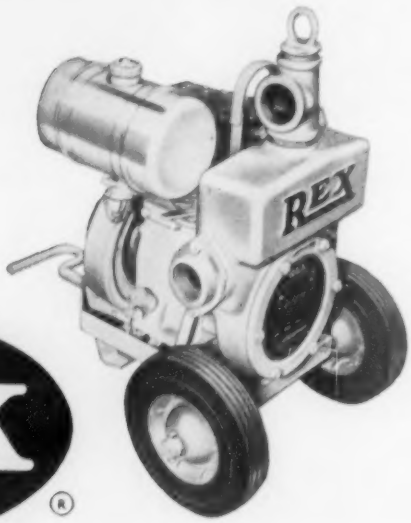
Transferring oil



Water supply



Gathering line booster pump



REX®

The pump that never lets you down . . . on any oil field job!

On any job a Rex Self-Priming Centrifugal Pump outperforms all others! It works when you need it... starts instantly in cold or wet weather. It assures full capacity under toughest field conditions.

Only Rex Pumps have the exclusive adjustable air peeler that compensates for wear with a simple adjustment. You get *new* pump efficiency for the life of the pump!

And Rex Pumps are simple in design and construction... light in weight, yet built to stand tough oil field service. They're easy to clean and maintain... assure lowest possible operating costs.

Why not investigate these highly portable, dependable pumps for your work? Check your oil field supply store. For information on the stores that handle Rex Pumps write Rex Oil Field Sales Offices in: New York, Tulsa, Dallas, Houston, Midland or Los Angeles.

CHAIN BELT COMPANY

MILWAUKEE 1, WISCONSIN

Young Heat Transfer News

YOUNG RADIATOR COMPANY, RACINE, WIS.

Cool, Ventilate and Heat Iowa Power Plant with Young Mono-Weld Radiators

Like a chameleon, Radiators are ready for just about any climate or condition you can imagine. They'll keep stationary or mobile engines cool in the Belgian Congo . . . or do a whale of a job at Little America.

Take a look at all the tools Radiators use to do a real cooling job . . . baffles, by-passes, thermostats, pressure caps, coolants. Then, there are fans, pumps, and proven core designs . . . and engineering experience.

Radiator cooling eliminates needless troubles. It does away with engine hot spots, excessive oil consumption, carbon deposits, burned valves and valve seats, stuck pistons and other engine failures experienced with other types of cooling systems.

Don't be fooled by the claims of other types of engine cooling systems. Remember, only Radiators can provide efficient engine cooling under every type of climate or condition.

WRITE FOR FREE YOUNG RADIATOR COMPANY *MONO-WELD* RADIATOR CATALOG

Mono-Weld Jacket Water Cooler features are completely illustrated and fully described. Capacity and accessory information is given for various models in the Young Radiator Company line. Address your request for Catalog No. 1651 to, Young Radiator Company, Dept. 205-F, Racine, Wisconsin.

Young Jacket Water Coolers Utilize Waste Engine Heat

Sioux Center, Iowa, Municipal Power Plant has taken full advantage of two Young Radiator Company Jacket Water Coolers used to dissipate engine heat in a recently added Nordberg supercharged, 1060 hp., Diesel engine.

Young Jacket Water Coolers have been invaluable not only for rejecting engine heat up to 1,530,000 B.T.U. per hour, but also for utilizing this heat to reduce plant heating costs.

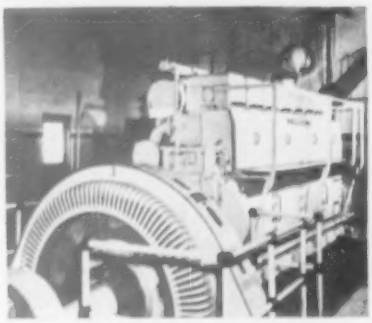
Located in the southwest corner of the building, which is equipped with louvres on the south, west and north walls, the Young Jacket Water Cooler shutters can be controlled to draw air through either one or both Coolers. Doors between engine and Cooler rooms may be opened or closed to draw either hot air out the engine room in summer for ventilation, or deliver hot air to the engine room during the winter heating months. A thermostatically controlled by-pass valve in the jacket water circuit of the engine maintains constant water temperature to the engine.

Young Radiator Company Jacket Water Coolers of rugged, *Mono-Weld* welded steel construction are available with water cooling capacities ranging from 500,000 to 2,300,000 B.T.U. per hour.

Accessories available for these Young Coolers include: fan motor; drive belts; sheaves; pump; oil-cooling coils; gas-cooling coils; manual or automatic (air, vacuum or electric) shutter controls; front core guard screen when shutters are not required; warm-up curtain used with screen; and surge tank.

For additional details write for free Young Radiator Company catalog offered in column at left.

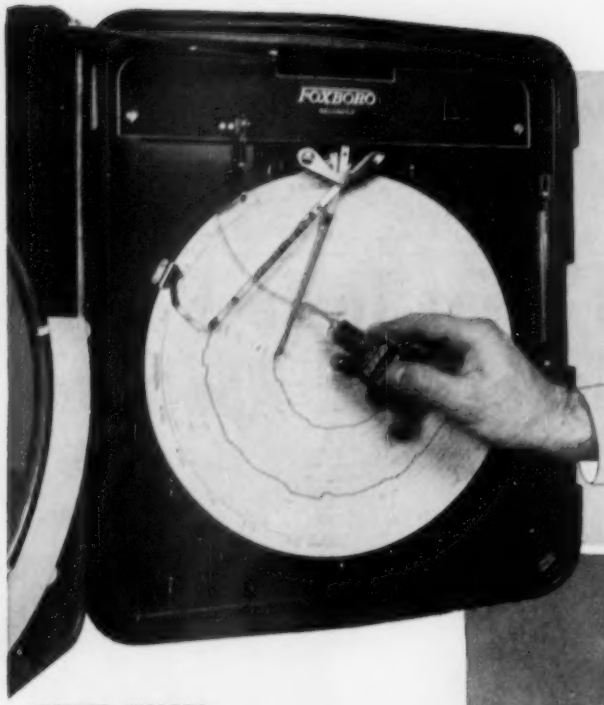
View of Young Radiator Company Mono-Weld Radiator



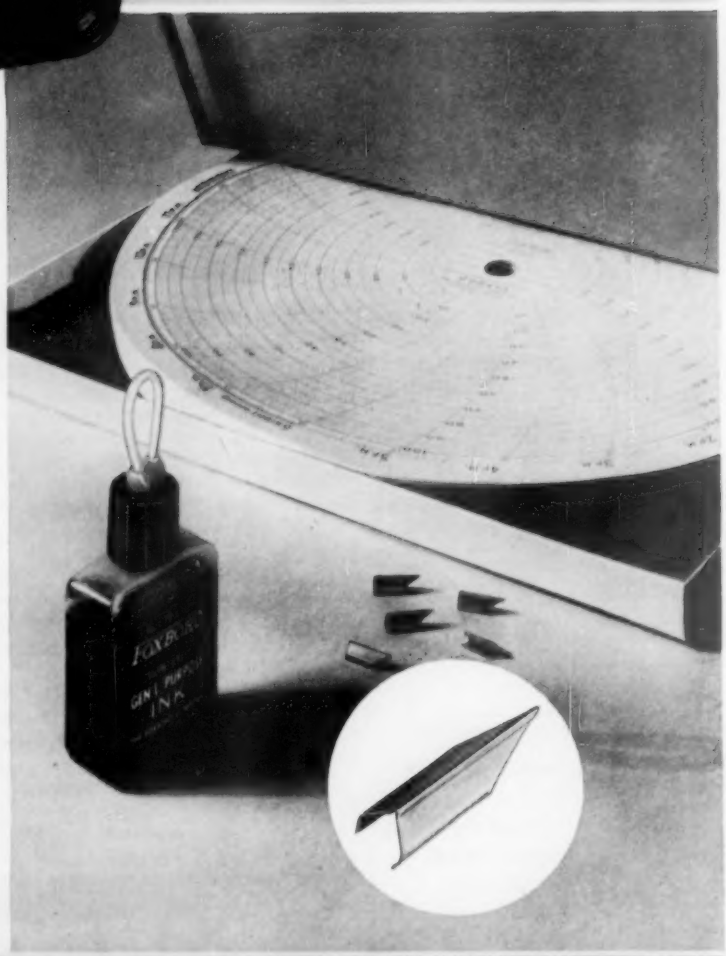
Nordberg Diesel engine cooled by Young Radiator

Mono-Weld is a Young Radiator Company Trademark

Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY
Heat Transfer Products for Automotive, Aviation and Industrial Applications. Heating, Cooling, Air Conditioning Products for Home and Industry.
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois



Better Records



BETTER CHARTS

Humitex Charts printed from high-precision plates, under controlled humidity conditions, on special, high-stability paper. Easy-to-read gray printing against chart's smooth, white background brings out full brilliance of new Foxboro Ink.

BETTER PENS

Non-corroding, stainless-steel pens with positive capillary feed. Controlled special-process points (standard and fine line) assure sharper, cleaner records.

BETTER INK

Five rich, brilliant colors . . . won't clog or "feather" . . . sediment-free . . . flows smoothly under all atmospheric conditions. Specially formulated for new Foxboro Pens and Charts.

NEW INK DISPENSER

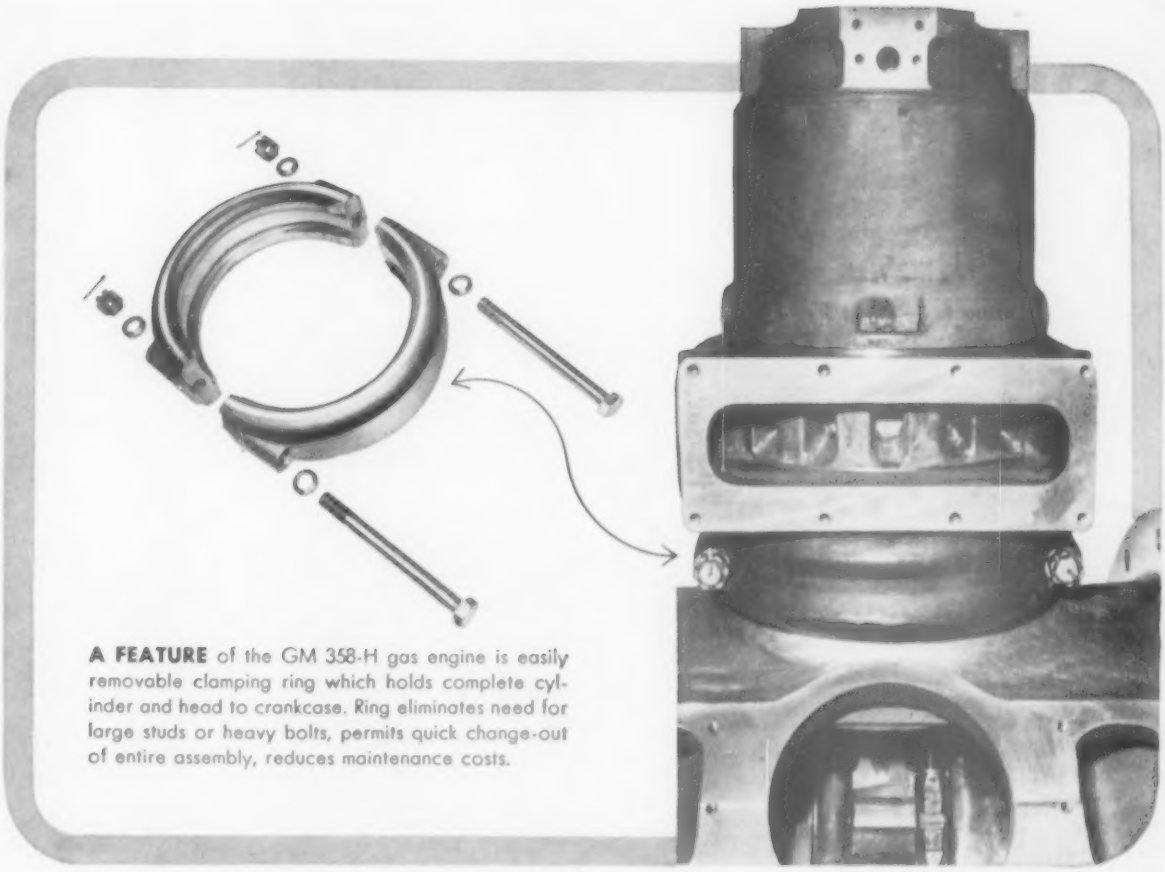
Exclusive-design, easy-to-handle polyethylene "squeeze" dispenser (pat. pend.) gives pin-point control of drop size, ends messy pen-filling. Won't leak or break.

THE FOXBORO COMPANY
606 NEPONSET AVE., FOXBORO, MASS., U.S.A.

FOXBORO REG. U S PAT. OFF.

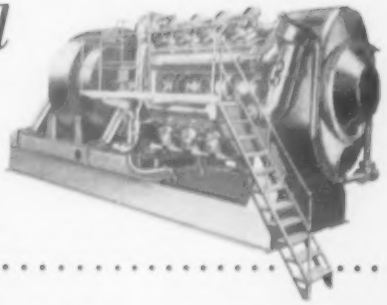
FOR BETTER RECORDS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND



A FEATURE of the GM 358-H gas engine is easily removable clamping ring which holds complete cylinder and head to crankcase. Ring eliminates need for large studs or heavy bolts, permits quick change-out of entire assembly, reduces maintenance costs.

Lightweight, medium-speed **pipeline power**



The General Motors 3300-h.p. 358-H gas engine has features that make it your best buy for pipeline pumping power.

Light weight per horsepower, including attached accessories, reduces foundation requirements.

Freedom from vibration throughout its operating range also permits lighter foundations.

Medium-speed rating gives a lower step-up ratio speed increaser than is required by slower-speed engines.

Over-all dimensions are less than slower-speed engines in the same class. This means lower powerhouse building costs.

These are the features that will save you money in installation costs when you install a GM 3300-h.p. engine.

Full details and engineering specifications are yours promptly upon request.

General Motors 358-H Gas Engine

GM
CLEVELAND
DIESEL

CLEVELAND DIESEL ENGINE DIVISION
General Motors
2160 West 106th Street, Cleveland 11, Ohio

BUILDERS OF DIESEL, DUAL-FUEL AND NATURAL-GAS-BURNING ENGINES—FROM 150 TO 3300 H.P.

GOING PLACES *is always easier with Cities Service...*

Helpful directions to travelers on major turnpikes is just one small reason why the green-and-white emblem renews its welcome daily.

CITIES SERVICE
A Growth Company

Number 10 of a series

KING SIZE

This giant 37 ton Cat Poly Reactor is one of 4 units shipped to a large petroleum refinery in the State of Washington. It is 4'-3½" in diameter by 32'-0" long and has a 1 3/16" thick shell. Each of its 8" thick heads is attached to the shell channel with 28 special alloy stud bolts 2¾" diameter by 15¼" long having nuts 4¼" across the flats. Into the 5¾" thick tube sheets 190 tubes, 2½" O. D., No. 5 gauge and 30'-0" long, are rolled and seal welded. Designed for 1,230 lbs. pressure on the tube side, the reactor was completely X-rayed and stress relieved.

Vogt, a leading builder of shell and tube reactors for poly plants, has the competently skilled personnel and modern mechanical facilities with which to provide heat transfer equipment for the most exacting services in petroleum refineries, chemical plants, and related industries.

Reactors ...by Vogt

A bulletin describing the wide range of heat transfer equipment built by Vogt is available upon request.

HENRY VOGT MACHINE CO., LOUISVILLE, KENTUCKY

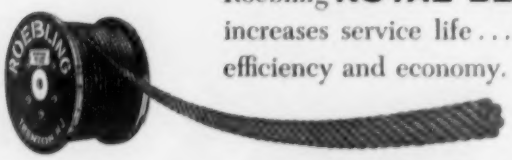
BRANCH OFFICES: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

NOW! SLASH WIRE ROPE COSTS WITH ROEBLING'S NEW

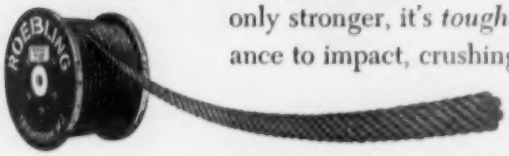
Royal 1105 Blue

15% STRONGER THAN YESTERDAY'S STANDARD

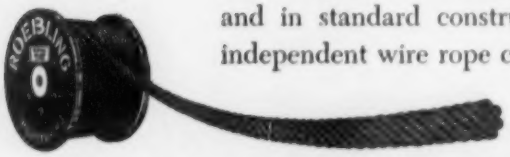
MADE OF ROEBLING'S NEW TYPE 1105 WIRE—the finest rope wire—Roebling **ROYAL BLUE** Wire Rope is guaranteed to be 15% stronger than standard wire ropes of the same size and construction.



Roebling **ROYAL BLUE** Wire Rope vastly increases service life . . . brings unprecedented efficiency and economy.



Roebling **ROYAL BLUE** Wire Rope is not only stronger, it's *tougher,* too . . . has top resistance to impact, crushing, abrasion and fatigue.



You'll soon be able to get **ROYAL BLUE** Wire Rope in all diameters from ¼" to 3½" and in standard constructions employing an independent wire rope core.

Get the whole story on Roebling **ROYAL BLUE**—the most important wire rope development in a score of years. Write us, or contact your distributor or nearest Roebling branch office.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4501 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6215 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

DU PONT REG. U.S. PAT. OFF.

PETROLEUM CHEMICALS DIVISION

NEWS

DU PONT REG. U.S. PAT. OFF.

June ★ *One of a Series of Interest to the Petroleum Industry* ★ *1955*

New TEL Plant to be built by Du Pont in California

A new convenience will soon be realized by West Coast refiners when the planned Du Pont tetraethyl lead manufacturing plant near Antioch, California is completed.

The rapidly growing TEL requirements of the West Coast petroleum industry prompted the Du Pont Company's decision to build the plant in the California location. The site is approximately two miles east of Antioch on the San Joaquin River. It is readily accessible to both water and rail transportation.

Construction of the new plant is expected to get under way this summer. In addition to the TEL manufacturing facilities, a "Freon" refrigerants plant will also be constructed on the same site.

9 out of 10 WANT it

. . . and your dealers can profit by offering it

Oil check is the most important dealer service, say 90% of the motorists interviewed in a survey of consumer service station buying habits.

But does a check of the dip stick really sell oil? Actual service station observations show that almost half of the motorists who receive it buy oil as a result of the check. Yet customers are offered an oil check on only 36% of their service station stops.

This means that your dealers can increase their motor oil sales simply by offering to check the dip stick for *every* customer. To help you emphasize this profitable point to your dealers, we have prepared a new booklet (No. 4) in the "Looking through the windshield" series. The title is, "A look at the motor oil buyer."

Ask one of our representatives for sample copies and cost information on obtaining them in quantity.

You can profitably expand your diesel fuel market with Du Pont FOA-2

In addition to their growing demands for more diesel fuel, the railroads are endeavoring to reduce operating costs. In order to meet these demands and maintain your profit margin, you may be faced with the problem of producing diesel fuel at lower cost.

That's a tough problem, to be sure. But it *can* be solved. And here's how Du Pont Fuel Oil Additive No. 2 can help you solve it, *profitably*.

You simply use Du Pont FOA-2 to stabilize your cracked distillate stocks. Its double-action stabilizing and dispersant effect enables you to overcome the incompatibility between blends of cracked and straight-run stocks.

And this means added production flexibility for you . . . helps you keep your heating oil stocks in better balance to meet varying seasonal demands.

Proven results

Many leading railroads are now using No. 2 fuel oils containing Du Pont FOA-2. And they have reported excellent results.

They have proved through careful testing that they can efficiently operate diesel engines on cracked distillates stabilized with Du Pont FOA-2 without harmful effects.

Good filterability

Because of its excellent dispersant action, FOA-2 improves the filterability of diesel fuels. In this way it helps to eliminate most injector-sticking and filter-plugging problems.

Non-sparking

Being an *organic, non-metallic* additive, Du Pont FOA-2 does not contribute to the exhaust stack sparking problem.

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *Diesel Fuel Additive*

Economical

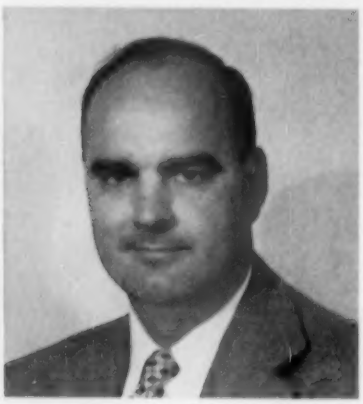
Du Pont FOA-2 is extremely economical to use because it is effective in low concentrations. And you need no special equipment for adding it.

Test it yourself

Your fuel laboratory can easily test the effectiveness of FOA-2 in your own fuel oil stocks.

Free samples and complete technical information are readily available. Any Du Pont Petroleum Chemicals Division representative or regional office will be glad to supply them.

PHILADELPHIA DISTRICT MANAGER



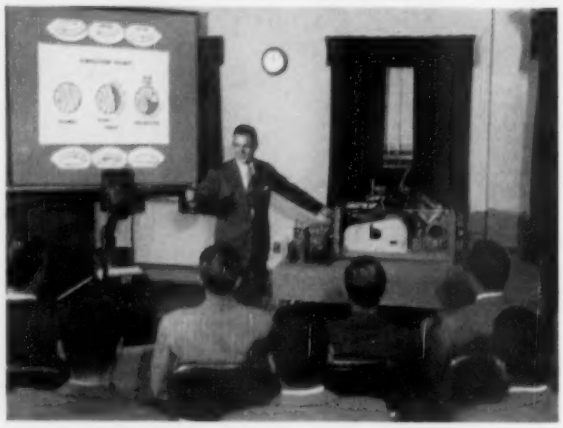
LEWIS Z. CAREY is manager of the Du Pont Petroleum Chemicals Division's Philadelphia District, which serves the Delaware Valley area and the states of Maryland, Virginia, and North Carolina.

A graduate of the University of Delaware, he joined the Du Pont Company in 1941. He was a salesman in the Alcohol Division until 1950 when he was transferred to the Petroleum Chemicals Division as a sales-service representative.

Mr. Carey is vice-chairman of O.I.I.C. in New Castle County, Delaware and is active in both Delaware and Maryland O.I.I.C. activities.

During World War II, he served with the U. S. Navy.

HIGHLY SENSITIVE DEMONSTRATION ENGINE... to build dealer enthusiasm for your gasoline quality



Engine readings can be projected directly onto a screen for showings to large audiences. Or the unit can be set up on the back platform of a station wagon where the performance can be shown with the direct reading instruments.

Here is a brand new demonstration tool with an amazing talent for persuasion.

Gasoline quality may be one of the hardest things in the world to demonstrate clearly, even to dealers. But this new, single-cylinder engine setup can do it with superb showmanship. And if you want to turn a "doubting Thomas" into a satisfied customer, here's just the tool to do it with.

High compression engine

The unit is built around a single-cylinder engine with a 9.0 to 1 compression ratio. Other compression ratios are also available. With overhead valves and a hemispherical combustion chamber, it follows the latest design features of truly up-to-date automobile engines.

The engine is belted to an alternator and the power developed is dissipated in resistance grids.

Versatile

All types of combustion – normal, detonation and surface ignition – can be readily demonstrated with the unit. It can also be used to clearly demonstrate the wide variety of factors which influence knock – such as temperature, humidity, barometric pressure, spark timing, carburetor setting, etc.

Even wild ping and the various factors influencing surface ignition can be realistically shown.

Extremely sensitive, this engine will show up very slight differences in octane rating. And it is flexible enough to be adapted for tailor-made demonstrations to point up your own individual gasoline quality features.

Available soon

A number of these single-cylinder engine units are now being made and will soon be available to you on loan through any of our regional offices.

DU PONT

Better Things for Better Living
. . . *through Chemistry*

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • *Wilmington 98, Delaware*

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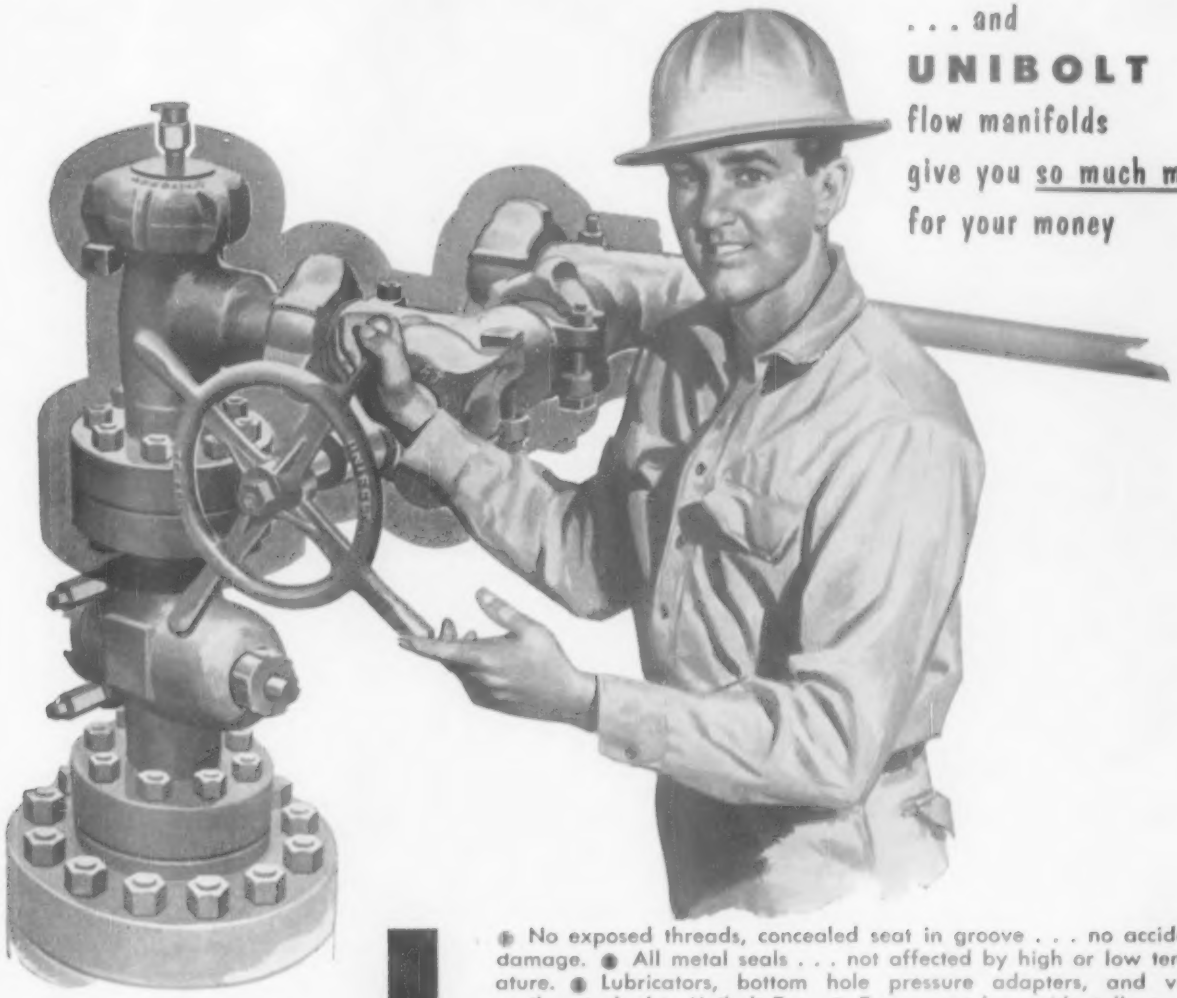

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and in "SA" stainless steel for corrosive conditions.

● No exposed threads, concealed seat in groove . . . no accidental damage. ● All metal seals . . . not affected by high or low temperature. ● Lubricators, bottom hole pressure adapters, and valves easily attached to Unibolt Tee. ● Tee cannot be accidentally opened. ● Unibolt stronger than tubing threads . . . ideal for working trees with welded lift nipple. Tubing threads in Tee if desired. ● Wing Valve requires no grease to effect seal. ● Variable opening speeds up initial clean-up or running initial flow tests . . . saves rig time. ● Unrestricted 1" opening in Wing Valve will pass 10,000 bbls. fluid per day with 100 lbs. pressure drop. ● Valve stem packing needs no tightening . . . stem turns freely under high pressures. ● Threads on stem not exposed to internal or external damage . . . full 2½" pilot for true stem alignment and rigidity. ● Stem seat sealed by power threads and metal gasket assures alignment. ● Nitride hardened stem and stem seat . . . resists corrosion. ● Choice of hard chrome plated or "SA" stainless stems and seats. ● Positive Choke Body takes regular or "X" Beans . . . all beans flow-rated. ● Shaped entrance on beans prevents paraffin clogging. ● Positive Choke Body may be replaced with inexpensive tee and cage nipple, or can be converted to Adjustable Wing Valve by substituting two parts. ● Streamlined flow . . . no obstructions . . . no turbulence.

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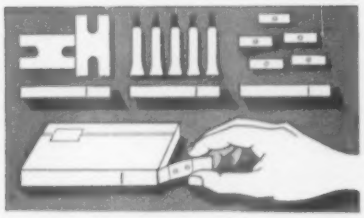

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"The death in San Antonio at 92 of this petroleum pioneer who believed in himself and also believed he knew where oil and natural gas could be found removes one of the most picturesque figures identified with the discovery of oil at Spindletop, the Lucas gusher, and other stirring events of 54 years ago which marked the founding of the great American petroleum industry . . .

"Like other Americans who have stamped their identities and personalities indelibly on some great American industry . . . Mr. Higgins was a rugged individualist . . . Mr. Higgins lent distinction and color to this group of Americans who do things for themselves and reap rewards of private initiative."

Editorial in the Beaumont Enterprise.

Should Trans-Canada Be Favored?

"The Canadian Cabinet was forced again this week to face the urgent problem of finding a market for Alberta natural gas. C. D. Howe was reported to be proposing a plan . . . for exporting increased quantities from Manitoba and importing enough from the U. S. at Niagara to build up the eastern markets. The plan is being presented as a means of developing a large enough gas market in Ontario and Quebec to justify an all-Canadian line 5, 6, or 7 years from now.

"The new plan cannot be expected to be popular either in the cabinet or parliament since both have been committed to Mr. Howe's earlier and soundly Canadian policy of serving eastern Canada before exporting any more gas to the U. S. The proposed flat reversal of policy might be justified on the grounds that (a) while the Canadian line would have been preferable to build first, it has proved to be impracticable to finance; and (b) the second best plan then is to make arrangements with the U. S. which will eventually make the line across northern Ontario economic and thus capable of being privately financed.

"At this point a second difficulty will have to be overcome . . . It is how to justify continued government support for one particular company which gained its favored position only

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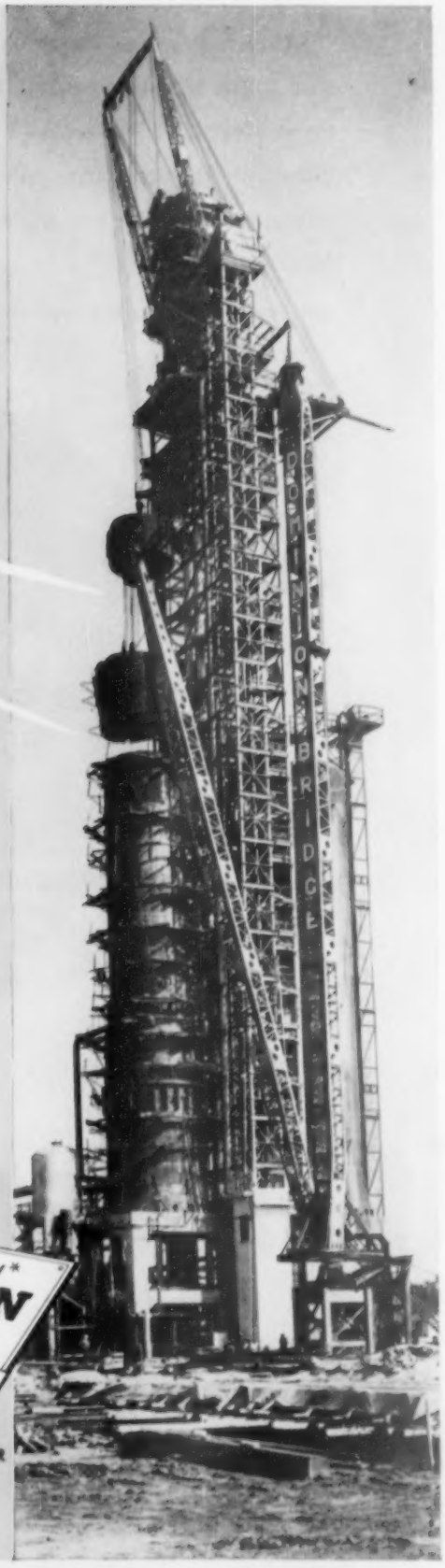
SOLVING PLATEWORK PROBLEMS



THIS PROBLEM, presented to us by the Sun Oil Company, Ltd. for their Sarnia refinery, through The Catalytic Construction Company of Canada, involved the fabrication and erection of the main vessels for the first Houdriflow unit ever built in this country. The kiln reactor measured 20 ft. 6 ins. (max.) diameter by 128 ft. high and weighed 325 tons. The surge hopper measured 15 ft. in diameter by 50 ft. high and weighed 70 tons.

FABRICATION PROBLEMS resulted from the size of the vessels and the numerous types of carbon, alloy and clad steel plate used to withstand process requirements; and from the complicated internal construction of the kiln reactor, with its 8 heads and 8 cooling coils composed of hundreds of pipes.

ERECTION PROBLEMS came from the fact that these massive vessels had to be field assembled to a total height of 270 ft. For this work, special lifting equipment, including a 150-ton guy derrick, was designed and built by Dominion Bridge Company.

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by promising to build an all-Canadian line. If government policy is to be reversed, then there are other interests which have all along had ambitions to pipe Alberta gas east through the U. S. Should they not be given another chance? . . .

"The situation we find ourselves in now again makes clear the desperate need for a competent government authority on all energy problems. Canada simply cannot allow the disposition of its vital power resources to be left to 'second best' choices."

Editorial in Toronto's Financial Post.

Plastic History Made

"Teamwork, leadership, growth—I believe these words come nearest to the true significance of the start of our huge construction projects to produce Marlex, Phillips superior new polyethylene plastic. The projects are a Marlex plant at our Adams terminal chemical works near Houston, an ethylene plant at the Sweeny refinery, and a connecting pipeline. . . .

"Just a year ago we announced discovery of this remarkable material and started to sample the plastics trade with test quantities. The results show that Marlex—tough and with great resistance to heat, moisture, and chemicals—should replace large volumes of plastics now used by makers of many consumer products. These include packaging films, nonbreakable bottles, pipe, wire insulation, and molded articles, plus entirely new uses made possible for the first time.

"Marlex is the most important plastics development since the first commercial production of polyethylene in 1939. Marlex ranks along with and may even surpass our carbon black and synthetic-rubber developments in its impact on the chemical industry. It is a most fitting climax to the thirtieth year of Phillips research. . . ."

K. S. Adams, chairman, Phillips Petroleum Co., in the June issue of Phillnews, company publication.

Atomic Energy Will Boost Oil

"Atomic energy will not supplant petroleum, but in fact will create new uses, new demands, and new horizons for oil.

"Despite the fact that intellect and research have unlocked vast new sources of energy, I assert with confidence that just as petroleum has been the one vital element in the advance of the last century, so will it be the life blood of our economic destiny in the foreseeable future.

"It is my opinion that the current phenomenal increase in the demand for petroleum products will be vastly accelerated, and that many of you will

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G-B couplings eliminate flanging, threading, welding. No special tools or skill required to install them. Result: Tremendous savings in installation time.

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live to see the day when we will be called upon to supply a domestic demand of from 15 to 20 million barrels every day . . ."

Walter S. Hallanan, president, Plymouth Oil Co., in addressing the annual meeting in Pittsburgh of the Pennsylvania Grade Crude Oil Association.

CALENDAR OF EVENTS

JUNE

30-July 1 Research conference, "Flow of Natural Gas From Reservoirs," University of Michigan, Ann Harbor.

JULY

20-22 Instituto Tecnologico y de Estudios Superiores de Monterrey, first annual short course on instrumentation for industry, campus, Monterrey, N. L., Mexico.

AUGUST

15-16 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.

29-31 15th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

26-Sept. 15 Graduate summer session in reservoir engineering, University of Texas, Austin.

SEPTEMBER

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.

12-14 American Institute of Electrical Engineers, electrical conference of the petroleum industry, Shamrock Hotel, Houston.

12-16 Tenth National Instrument Conference and Exhibit, Los Angeles, Calif.

12-16 Second International Instrument Congress and Exposition and tenth National Instrument Conference and Exhibit, Shrine Auditorium, Los Angeles.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

14-17 American Association of Petroleum Geologists, western Canada regional meeting and fifth annual field conference of Alberta Society of Petroleum Geologists, Jasper, Alberta, Canada.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

26-28 American Institute of Chemical Engineers, fall national meeting, Lake Placid Club, Lake Placid, N. Y.

29 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

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DON'T OVERBUY LET M-C HELP YOU DECIDE WHETHER VERTICOLD WILL HANDLE YOUR JOB

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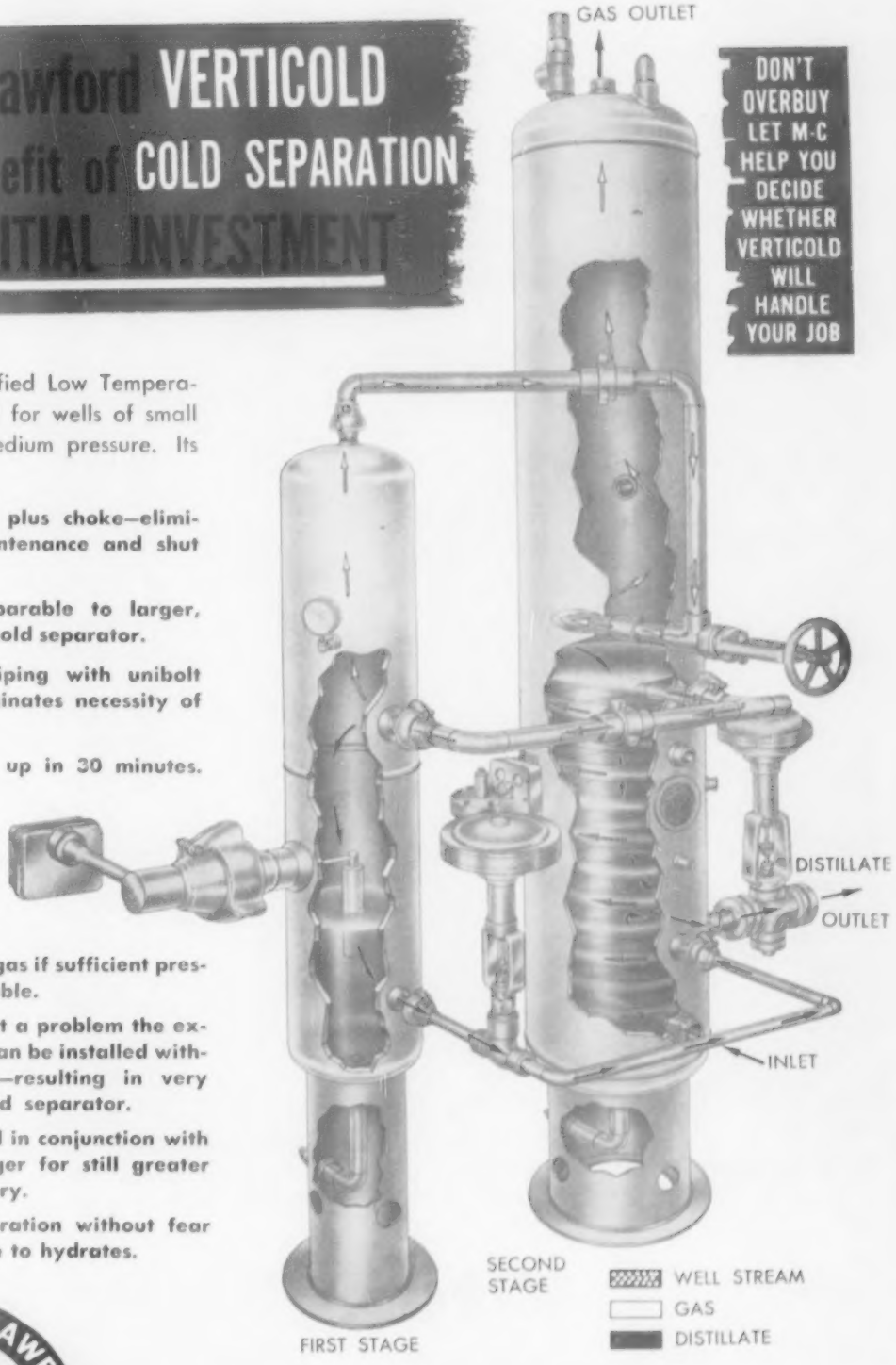

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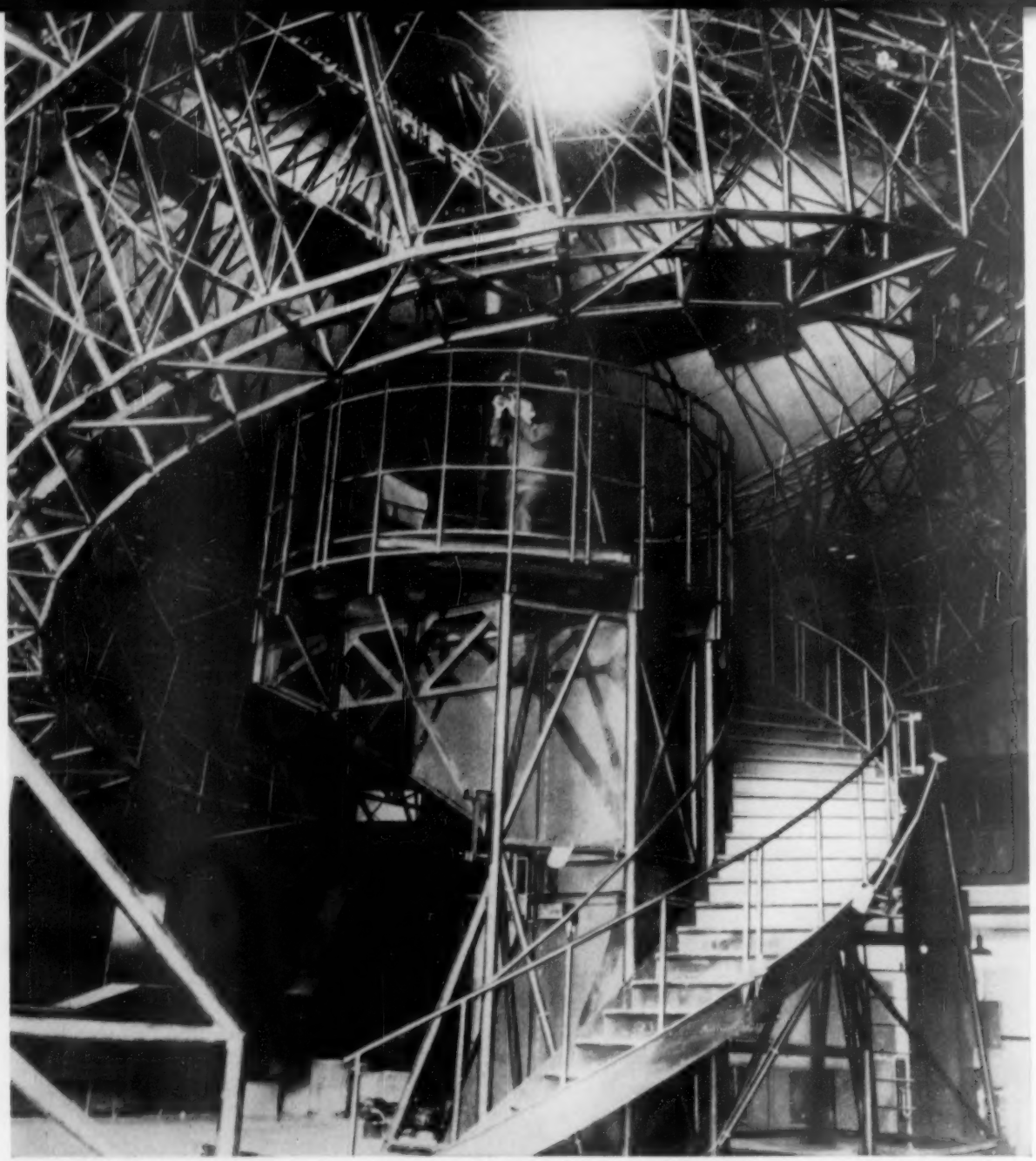

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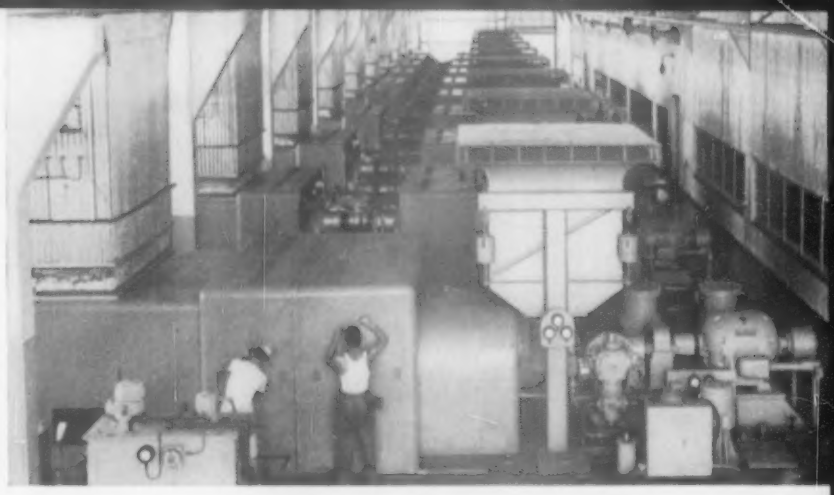
The controls on the world's fastest submarine; the most advanced airborne navigation system known to exist; other similarly advanced military systems and equally advanced industrial equipment and control systems are outstanding examples of the work of the producing companies of General Precision Equipment Corporation. More than a dozen major industries are served by instrumentation and systems designed, developed and produced by GPE Companies.

Ten of the companies in the GPE Group – notably Askania, Kearfott, Librascope and Link Aviation–devote substantial resources to the development and manufacture of instruments, servos and controls. These are used in equipment and systems developed by these companies



PROCESS CONTROL—Askania controls regulate speed of the ten turbines which develop compression to maintain gas suction pressure in Creole Petroleum Corporation's giant, pile-supported oil drilling operation on Lake Maracaibo, Venezuela.

SUBMARINE OPERATION—Controls developed and produced by Askania Regulator Company are utilized to govern operation of U. S. Navy's modern Guppy type submarines.

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ELECTRONICS	●●	●●●	●●●		●●●	●	●●		●●●	●●	●●●	
HYDRAULICS, LIQUIDS PROCESSING, HEAT EXCHANGE	●●				●●●				●●●			
TELEVISION Studio, Theatre, Educational, Business, Industrial	●	●		●●●		●				●		
INSTRUMENTS, SERVOS, CONTROLS Hydraulic, Pneumatic, Magnetic, Electronic	●●●	●	●●	□●●		●●●	●●	●●		●●●	●	●●●
AIRCRAFT and MISSILE GUIDANCE, CONTROL, SIMULATION	●●●	●		●●●		●●●	●			●●	●	●●●
AUTOMATIC COMPUTERS and COMPONENTS	●●●	●	●	□●●		●●●				●●●		●●●
RADAR, MICROWAVE, ULTRASONICS	●●●	●	●●	●●●		●●		●		●		
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NUCLEAR POWER COMPONENTS and CONTROLS	●●●				●●					●●		●●●
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themselves, as well as in systems and equipment developed and produced by other manufacturers of advanced technological equipment.

All GPE Producing Companies work in the advanced areas of highly specialized fields and are engaged in the design, development, manufacture and sale of equipment which is closely related from a technical point of view. It is all precision equipment; it derives from similar fields of technical competence; it saves labor, increases productivity or achieves results which cannot be achieved with even limited use of on-the-spot manpower. The chart here shows the specialized fields in which the key GPE Producing Companies work.

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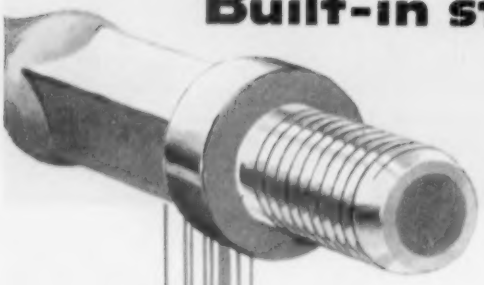

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OCTOBER

2-5 American Institute of Mining and Metallurgical Engineers, Petroleum Branch, fall meeting, Roosevelt Hotel, New Orleans.

2-6 American Society for Testing Materials, Committee D-2, petroleum products and lubricants, Statler Hotel, Washington, D. C.

3-4 Texas Mid-Continent Oil and Gas Association, 36th annual meeting, Baker Hotel, Dallas.

3-6 Rocky Mountain Association of Petroleum Geologists and Denver Geophysical Society, 25th annual meeting, Denver.

9-15 American Petroleum Institute, Oil Progress Week.

12-14 Gulf Coast Association of Geological Societies, annual meeting, Buena Vistal Hotel, Biloxi, Miss.

12-14 Gas Appliance Manufacturers Association, El Mirador, Palm Springs, Calif.

12-14 National Association of Corrosion Engineers, sixth biennial Permian basin tour, Lincoln Hotel, Odessa, Tex.

13-14 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

14 American Institute of Chemical Engineers, South Texas Section, 10th annual technical meeting, Galvez Hotel, Galveston, Tex.

17-19 American Gas Association and Pacific Coast Gas Association, annual meeting, Ambassador, Biltmore, and Statler Hotels, Los Angeles.

18-22 National Safety Council, 43rd National Safety Congress and Exposition, Chicago.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Garrett Hotel, El Dorado, Ark.

24-27 National Association of Railroad and Utilities Commissioners, natural gas panel discussion, Asheville, N. C.

27-29 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

28 Natural Gasoline Association of America, southern regional meeting, Captain Shreve Hotel, Shreveport.

31-Nov. 1 Independent Petroleum Association of America, annual meeting, Jefferson Hotel, St. Louis.

31-Nov. 2 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

NOVEMBER

2-4 Society of Automotive Engineers, diesel engine meeting, Chase Hotel, St. Louis.

2-4 American Association of Petroleum Geologists, Mid-Continent regional meeting, Skirvin Tower, Oklahoma City.

9-10 Society of Automotive Engineers, fuels and lubricants meeting, Bellevue-Stratford Hotel, Philadelphia.

10-11 American Association of Petroleum Geologists, Pacific Section annual convention, Biltmore Hotel, Los Angeles.

13-18 American Society of Mechanical Engineers, 75th anniversary meeting, Hilton and Blackstone Hotels, Chicago.

14-17 American Petroleum Institute, 35th annual meeting, Mark Hopkins, Fairmont, St. Francis and Palace Hotels, San Francisco.

27-30 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Detroit.

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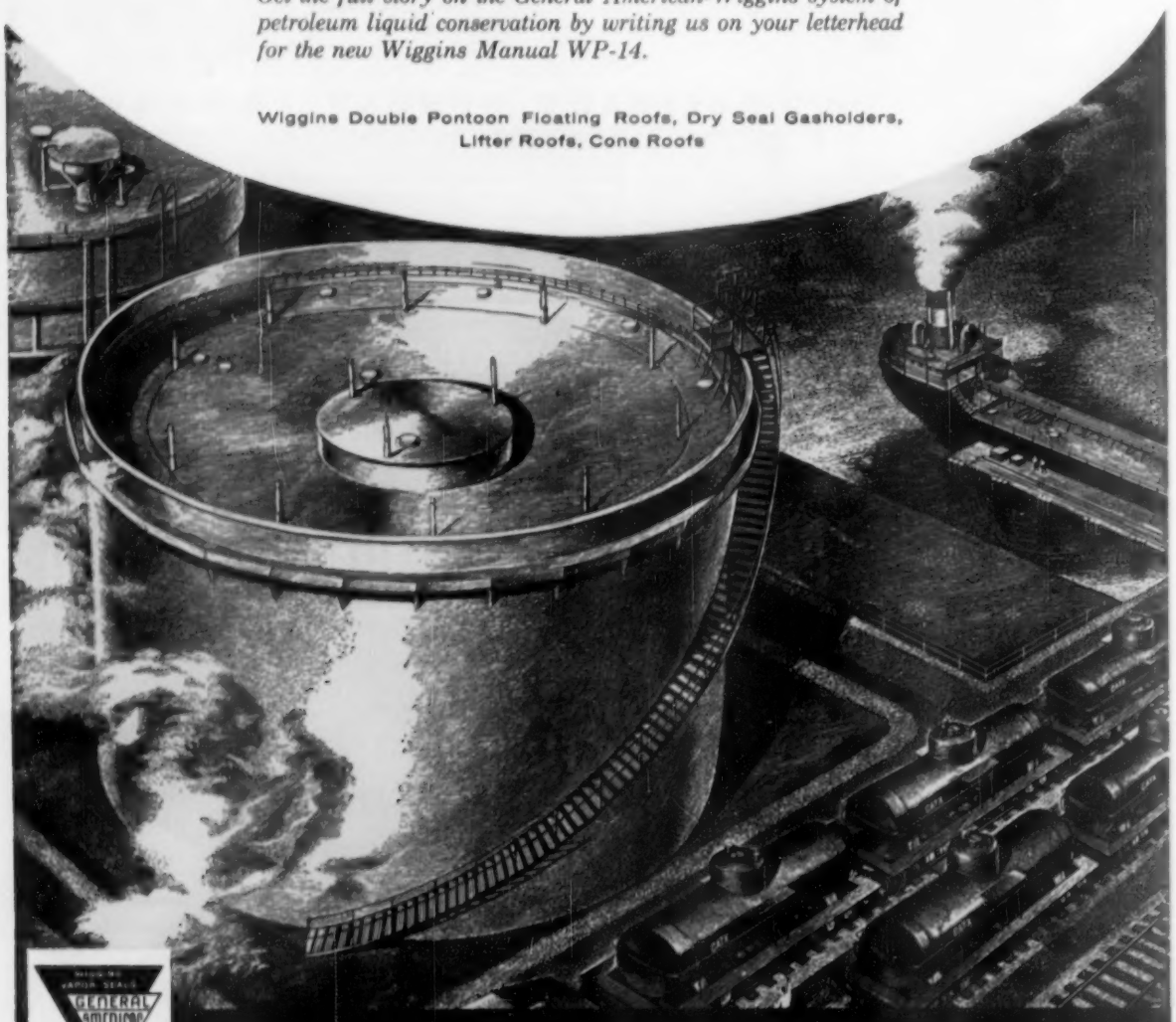

GENERAL AMERICAN TRANSPORTATION CORPORATION

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The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING...

So Bee It

THIS picture, as you can plainly see, shows a swarm of bees being removed from the piping of a petroleum installation. It is Lone Star Producing Co.'s Opelika cycling plant near Murchison in East Texas. The man is Red Gilbert, assistant plant superintendent and a beekeeper.

Now you probably will jump to the conclusion that we are printing this picture as an excuse to make a lot of silly cracks about to bee or not to bee, or about the pipe becoming a bee line. Or that the plant is now buzzing, keeping everybody as busy as a bee, and that Gilbert ought to let things bee.

But that's where you get stung. We wouldn't stoop to any such puerile punning, even though this opportunity is a honey.

The only reason we are printing this picture is to demonstrate that (1) all kinds of unexpected and unpredictable things keep happening in the oil industry and (2) the industry employs all known varieties of scientists, technologists, experts, and specialists, who are ready, willing, and able to cope with any contingency.

Get Ready for IGY

TWO years from next Friday, on July 1, 1957, is the official start of the International Geophysical Year, known as IGY for short.

The plans for IGY involve millions of dollars and thousands of scientists engaged in a program to probe the secrets of the earth.

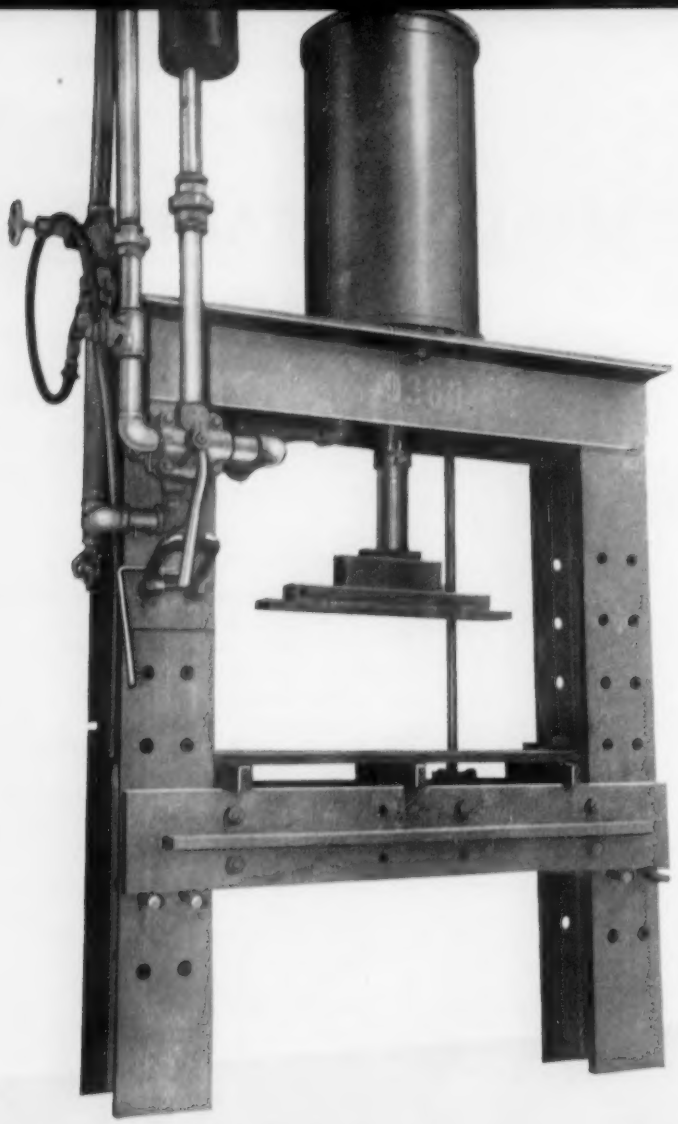
But hold your horses, you petroleum geophysicists. These millions of dollars won't be spent for your services. If 1957-58 turns out to be your "year" it will be due to a sudden upsurge in wildcatting, not to the preparations for IGY. This IGY is strictly for your long-haired, academic brethren.

We are indebted to the ubiquitous news bulletin of the National Geographic Society for the information that IGY is the successor to the First International Polar Year (1882-83), which studied Aurora Borealis, and the Second International Polar Year (1932-33), which studied the propagation of electronic waves through space. Earth sciences have progressed so fast that the International Council of Scientific Unions felt it essential to have another "year" in only 25 years instead of waiting the usual 50.

IGY will be devoted primarily to the study of cosmic rays, the upper atmosphere, sun spots, continental drift, and climatic changes. Scientists all over the world will peer through telescopes, fire off rockets, send up balloons, and stick thermometers in glaciers. The tabulated results will doubtless add to the store of human knowledge, but if unemployed petroleum geophysicists want to get in on it they will have to trade their seismographs for cosmic-ray counters.

Possibly in another quarter century the need for oil and other minerals will be so great that the next IGY will be devoted to what's below the surface of the earth.

—*Henry D. Ralph.*



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You lose practically none of the centering range, reach or performance offered by the centralizer on the way in to the cementing area. We absorb much of the loss in range due to set, that would otherwise be lost during the running of casing.

YOU GET THE RANGE YOU PAY FOR WHEN YOU BUY BAKER CENTRALIZERS . . .

And because flattening each spring also tests the spring for cracks or flaws that might result in excessive distortion or fracture you are assured of maximum performance from each spring.

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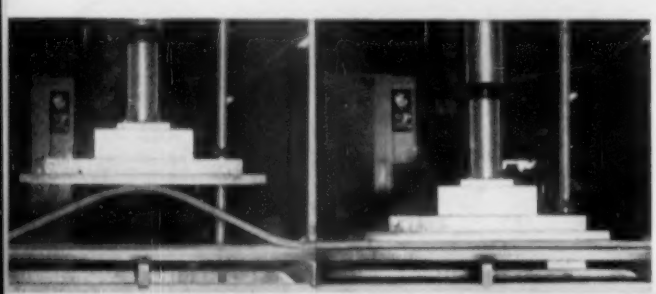

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Sit tight on crude now, for the future looks good

THREE recent sets of figures point up some trends in the course of oil which the industry should study carefully in both its short-range and its long-range planning.

- Proved reserves in this country, according to the A.P.I., did not increase last year as much as in previous years, although total drilling was greater.
- Crude-oil producibility, according to N.P.C. and I.P.A.A. studies, has increased considerably during the past year or so and this country now has something like 2,000,000 bbl. per day of unused producing capacity.
- Demand for petroleum, according to long-range forecasts of several companies, will increase steadily and rapidly in this country for the next several years, and even faster in other countries.

TAKEN TOGETHER, these studies suggest that the oversupply of crude, which so plagues the industry at present, may be far from a permanent thing. In a few short years, if imports are held to something like their present levels, domestic production may be up to a point considerably closer to practical M.E.R.

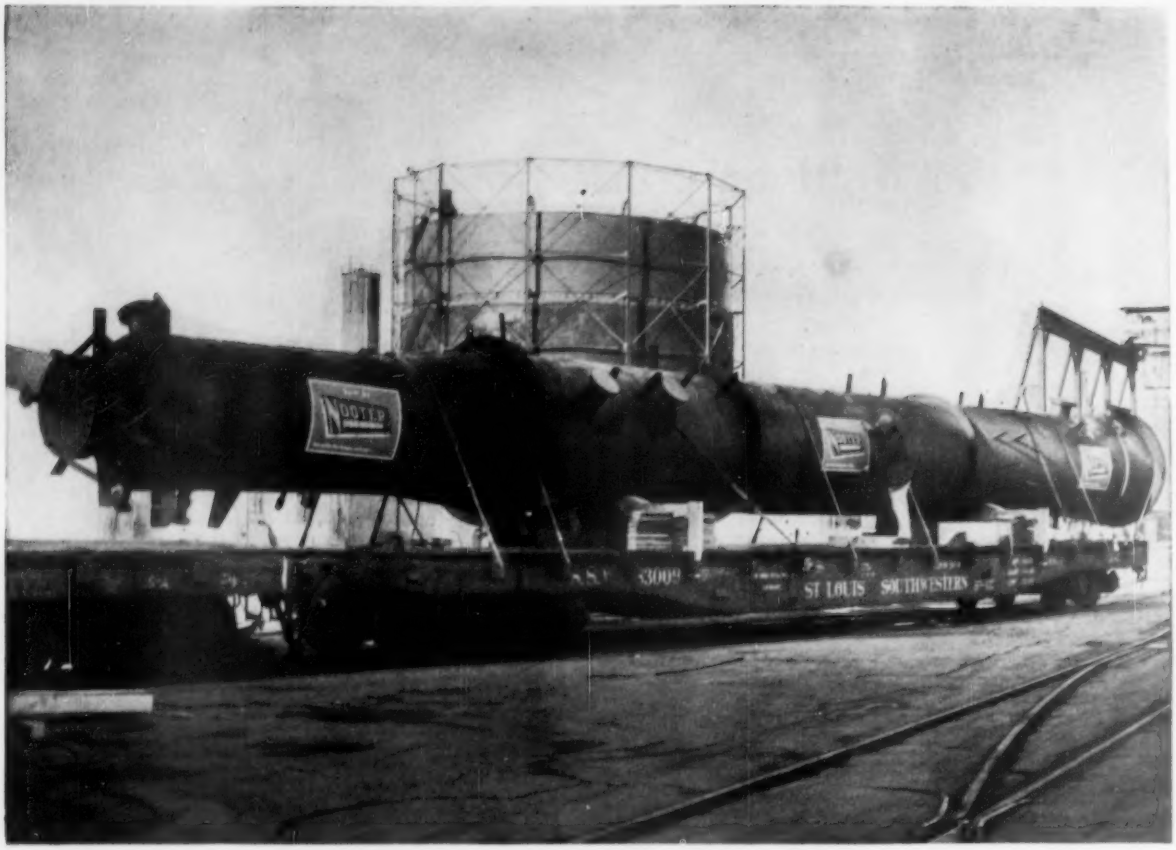
If this happens, imports will not be much of a problem. They can then be increased somewhat without injury to the domestic industry. The even faster growth anticipated in demand abroad should siphon off to other markets much of the crude now pressing to enter the United States.

It is unlikely that producibility can increase at a rate much faster than discovery of new reserves over a very long period, even though further efficiencies in production practices and recovery methods are to be expected. And because it normally takes a year or two to develop a newly discovered field to the stage of maximum production, there will soon be a real need to intensify exploration activity.

FOR THE SHORT RANGE, the industry should more or less sit tight with regard to present allocation of sources of crude supply. There is little need to rock the boat so long as the freshening breeze of increased demand promises smoother sailing to all producers.

Nor is there much need to rush pell mell to bring all fields to maximum producibility at a rate faster than the market will absorb their output. Orderly development and a little restraint in production will bring dividends later on.

For the long range, more emphasis will have to be put on wildcatting and finding new crude reserves before very long. If the demand forecasts and the reserve estimates are both correct, our backlog of excess producibility could decrease pretty rapidly.



Ready for transit is a tower fabricated by Nooter Corporation, of St. Louis, Mo. Utilizing approximately 90,000 pounds of 1⅜" thick 3½% nickel steel plate to meet A.S.T.M. specification A-203 Grade D, this tower was built for the petrochemical industry and will operate at minus 140°F.

Tough at MINUS 140° F

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THIS FRACTIONATING TOWER is built of a steel that resists embrittlement at *minus* 140°F.

Even at lower temperatures, users find this steel strong, tough, safe. In contrast, carbon steels and many alloy steels become embrittled at temperatures no lower than –50°F.

And another important fact about this steel: *it's a standard grade . . . low in carbon and containing 3½% nickel.*

Toughness, combined with good strength at sub-zero temperatures, is typical of low carbon steels containing nickel. In addition, you'll find they readily respond to fabricating operations, including welding.

From the many standard grades of nickel alloyed steels, you can usually select one which will give you the best set of properties to meet almost any fabrication and service demands.

Whatever your metal problem . . . whether it involves low or high temperatures . . . corrosion, wear, fatigue or other troublesome factors . . . send details of your difficulty for our suggestions. Make use of our wide practical experience. Write us now.

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THIS WEEK . . . . . IN THE NEWS

International

• Promising shows have been found in the first wildcat drilled in Jamaica. Base Metals Mining Corp. drilled to 6,300 ft. on the island's western tip. A second wildcat will be spudded about mid-July. Base Metals' concession covers most of the island.

• A syndicate has put up $4,160,000 development money for half interest in Glenn McCarthy's 970,000-acre Bolivian concession. A group including Keljikan Commercial Corp., a New York import-export firm, and V. B. Witherell, Denver, made the purchase. Development program will include 30 to 45 more wells and a 15-mi. feeder pipeline. McCarthy has two oil wells and one gasser on the concession.

• A new discovery has been completed in Venezuela. The test is in the state of Monagas about 2¼ miles northeast of nearest production in the Greater Oficina field. It produced from two zones at rate of 720 to 1,019 bbl. daily on 5-hour tests. Venezuelan Petroleum Co., a subsidiary of Sinclair Oil Corp., drilled the well and holds a large concession north of the producer.

Automation

• Automation is bringing a new industrial revolution to the oil industry. Millions of dollars are being spent annually on automatic controls. And their use is accelerating rapidly. The prospect: Capital outlay for automation may double in the next decade.

Government

• It appears that independent gas producers may remain under federal regulation. The Harris bill has cleared but one of four hurdles in 3 months, and little more than a month is left before congressional adjournment. Supporters believe only action by the White House can save the bill this session.

• A joint Navy-industry review board is going to Spain to check the new military pipeline. The Government wants to make certain the design and engineering for pump stations conform with accepted practices.

Exploration

• The exploration scene in Alberta is moving from the Pembina area near the center of the province to the Foothills Belt area to the west. Four companies paid more than $2.5 million for tracts in the Smoky River area near the Foothills Belt in a recent provincial lease sale. The sale's top bid was $10.5 million paid for a tract adjacent to Pembina.

Processing

• High-octane gasoline from gilsonite is expected of a plant to be built in western Colorado. American Gilsonite, subsidiary of California Standard and Barber Oil, will spend $10,000,000 on a plant to process about 700 tons daily, producing high-purity coke and gasoline.

• Union Oil's 1,000-ton shale-oil retort, now under construction in Colorado, will produce fuels competitive with petroleum fuels on the West Coast, company vice president, A. C. Rubel, predicts. To produce 40,000 bbl. daily, Union figures, would require a total investment of $75,000,000.

Drilling

• A wider range of use has been found for Borg-Warner's new sonic drill. Its inventor, A. C. Bodine, says the 2-year-long tests show the tool will cut soft formations. It originally was designed for work in hard rock.

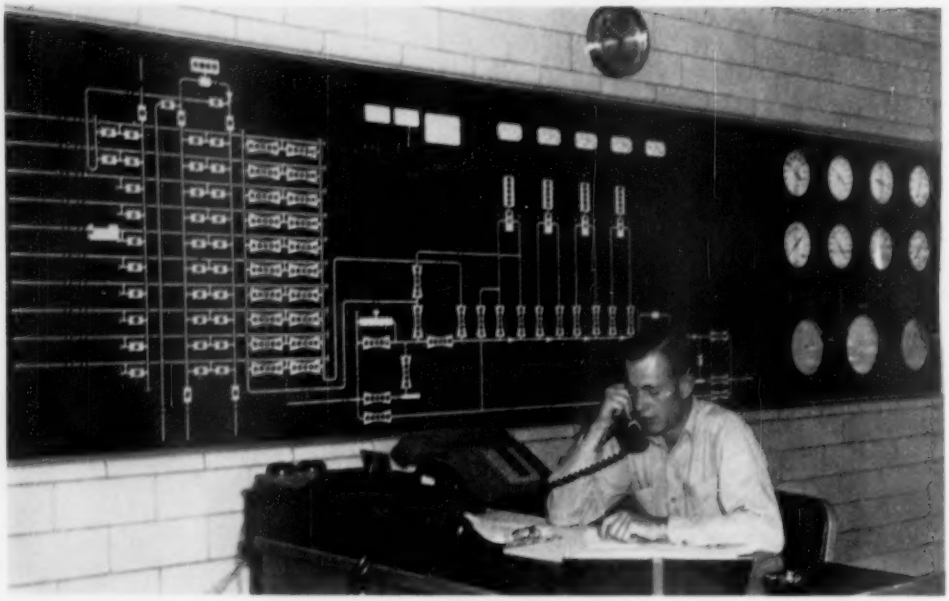
Pipelining

• The much-heralded three-way deal importing Canadian natural gas into the Pacific Northwest and stepping up gas deliveries from the Southwest into southern California will get a hearing before the Federal Power Commission next month. The deal involves Pacific Northwest, El Paso Natural, and Nevada Natural.

• Work has started on the first big pipeline to be built by a railroad. It is the 846-mile products carrier stretching from Los Angeles to El Paso, Tex., via Phoenix, Ariz. First pipe was laid early this month near Lordsburg, N. M. Completion is expected this year.

• H. C. Price Co. and Houston Contracting Co. will build most of American Louisiana Pipe Line Co.'s 1,004-mile, 30-in. line from Louisiana to Michigan. Their contract covers 783 miles of the natural-gas line. Brown & Root, Inc., Houston, will build the rest of the 30-in. line.

• The world's largest submarine pipeline—a 48-mile carrier from Burns Terminal, La., to the most distant offshore well on the Continental Shelf—will be in operation by July 1. It is owned jointly by Magnolia Petroleum Co., Continental Oil Co., and Newmont Oil Co. The line will gather both oil and gas from three offshore fields.



PRIME EXAMPLE of pipeline industry's approach to automation is operation of Platte Pipe Line Co. This control panel shows condition of all equipment at one station. Critical functions are telemetered to a central control office where operator has on-off control of motors and open-shut control over vital valves along the line.

What's Ahead for Oil in Automation

AUTOMATION is changing the face of the oil industry. This modern industrial revolution is not merely on its way. It has already arrived.

Pipelines are controlled by television. Refinery streams are guarded by electronic watchdogs. Geological calculations which require weeks for men to solve are performed by mechanical brains in a matter of hours.

And oil has barely opened the door on a new era of progress through automation—already a significant economic factor in the industry.

Having pioneered automatic controls for all industry, the oil business is ready to harvest the fruits of 20 years of trail-blazing in the field of push-button operations.

A survey by The Oil and Gas Journal indicates 15 per cent of annual capital investment in processing now goes into automation. Automatic controls account for 5 per cent of pipeline and production expenditures.

The share in exploration is 1 to 2 per cent, industry experts estimate, and drilling is 1 per cent or less.

The immediate outlook, moreover, is for wider use of automatic controls to perform tasks that once were done by hand. An informed forecast calls for the automation boom to surge upward as far in the next 10 years as it has in the past 20.

Yet experts polled by the Journal do not expect automation to dominate the discovery, drilling, production, refining and distribution of oil in the foreseeable future.

Automation has already had a wider use, over a longer period of time, in the oil industry than any other. Progress has been achieved gradually and without fanfare. Oil has experienced none of the disruptive effects which are causing concern in some phases of manufacturing.

After two decades of healthy, sustained growth, the prospect is for even greater strides forward.

PIPELINES

The leading candidates . . . The greatest degree of automation in the oil industry will probably be in pipelining. Unattended pump stations are already in use. Complete automation of any large pipeline system—crude, products or gas—is probably possible from a technical standpoint.

Economically it may never be feasible. Still the trend toward complete automation will undoubtedly continue in gathering, trunk-line, and terminal operations.

Complete automation is a much broader concept than simply the operation of one or two automatic or remotely controlled pump stations. This is only an intermediate step.

The completely automatic pipeline system implies an operation governed by an electronic computer or brain. The system would be self-motivating, self-governing. The brain would:

Accept instructions.
Reduce and interpret data.
Store data.
Program operations.
Issue orders or signals.
Correct errors by feedback.

THERE'S a boom ahead in oil-industry automation. Although two decades old, it's just getting out of its swaddling clothes. By 1965 a fourth of all processing investment may be going into instruments and other control devices. Pipeline and production outlays will double. Drilling and exploration operations also will adopt more and more automatic devices.

These are the predictions of The Oil and Gas Journal's Editorial Advisory Board, a group of engineering and operating experts representing every division of the industry.

The accompanying article was assembled by the Journal staff. But the viewpoints largely are those of members of the Journal's advisory board. An earlier article to which the advisory board contributed, "What's Ahead for 1955?" appeared in four installments, in the issues of January 10, page 65; January 17, page 78; January 24, page 79; and January 31, page 132. Another specialized survey article, "What Will Happen in Geophysics This Year," appeared in the Journal issue of February 14, page 72.

Change operations to adjust for new data or new conditions.

The brain would constantly be calling on its memory for data on line characteristics for each type of crude or product so that efficiency would remain at the highest possible level.

Interim tankage could be eliminated.

Fact or fantasy? . . . But there's at least a temporary hitch to the operations described above. The brain exists only in the imagination of engineers.

The large, high-speed digital and analog computers perform almost incredible mathematical feats. But they are designed for specific jobs. None has been built which is directly applicable to pipeline automation.

Development costs might run into millions of dollars. The cost of accompanying measurement, control, and communication facilities would be tremendous.

Maintenance of the complex equipment is another important consideration. The problem multiplies directly with the degree of automation. Labor costs saved by automation might be offset by costs of highly skilled technicians. Many think this factor alone is enough to rule out complete automation.

How much automation? . . . If complete automation of large systems is to be ruled out by economics, how far will pipelines go with automatic controls?

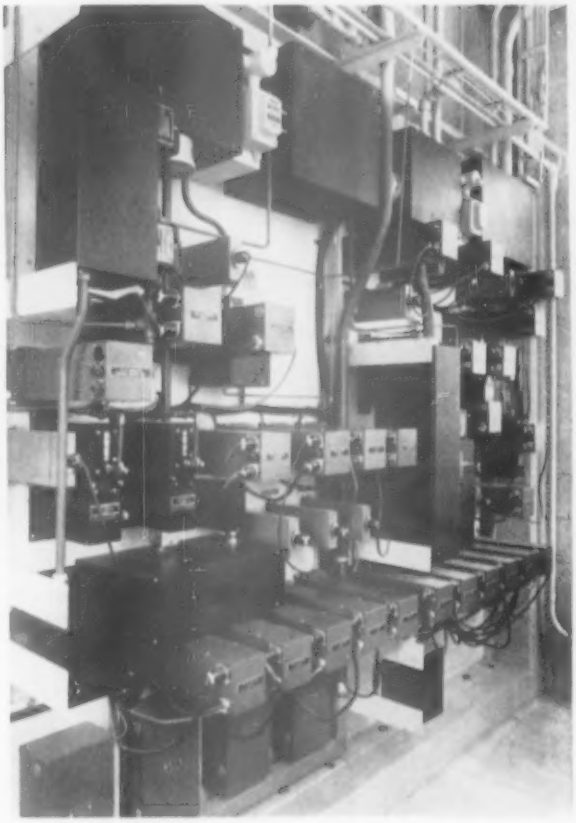
It is most likely that they will be applied separately to all phases of pipelining. Integration of separate phases into a semiautomatic system will continue. But in the next few years, full automation will be reached in small, simple systems only.

Gathering systems . . . When automatic custody transfer at the lease becomes a reality, the pipeline industry will have gone a long way toward automation of gathering systems. This is probably the most fertile field for automation.

Efficient control of the many small, widely scattered pump stations is a problem in timing and communications. Small stations operating on preset time cycles have been used for years. In other cases, stations are controlled over wire lines by pulse codes from a central office.

Control can still be exercised without the wire lines with VHF radio. Microwave is possible but probably too expensive for gathering-system use where many stations are involved.

The precedent has already been set for use of VHF and sequential tone generators to control and monitor operations. The Federal Communications Commission recently permitted a gas pipeline company to use VHF for an alarm system in a gathering unit. Also, VHF is being used on the Gulf Coast to control offshore production.



TROUBLE is quickly spotted at Rock Island Refining Corp.'s Indianapolis refinery. The electronic instruments at the back of a graphic panel for the Platforming unit spot the trouble. If a unit needs servicing, the service man has only to unplug it and replace it with a spare. All recorders and controllers are interchangeable.

With automatic lease batteries and radio-controlled gathering stations, centralized dispatching could be applied to one or many gathering systems. A computer thousands of miles away could program operations of every gathering station pumping into a major trunk line.

Instructions would be sent by microwave and relayed over VHF radio to individual receivers in gathering systems. As an interim method, a central office within the gathering district could exercise control.

Trunk lines . . . Automatic or remotely controlled pump stations have proved their value and will be used in increasing numbers. Automatic stations will be used principally for boosters. More reliable communication channels and control devices will make possible unattended injection stations—even those associated with tankage.

Microwave systems which were disrupted 3 to 7 per cent of the time a few years ago are almost 100 per cent reliable. This apparently slight improvement percentagewise actually bridged a wide gap between present operations and centralized remote control of trunkline stations.

Terminals . . . Now that mechanical tank gages have been codified by A.P.I., their use for custody transfer will become widespread. They have been employed in custody transfer for a longer time now than most companies will admit.

Averaging resistance thermometers are also considered better than periodic readings by a workman. Present methods of taking remote readings are giving users some trouble, but this temporary barrier will be removed.

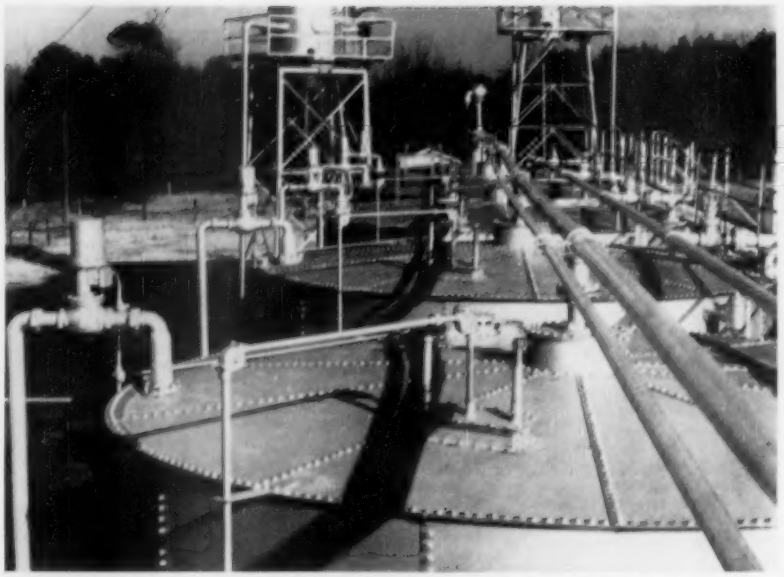
With remote-reading tank gages, thermometers, motor-driven valves, and automatic samplers joined into one system, today's terminals can definitely be called centrally operated. They may be only a few steps away from remote control.

Liquid meters . . . Long used for products, liquid meters are now being adopted for crude. Proving the accuracy of these meters is time-consuming and apparatus is expensive.

But the possible saving in tankage and vapors make their use very attractive. Also, crude meters have a definite place in an integrated system in the long haul toward automation.

PROCESSING

Processors were pioneers in automation, but the push-button refinery is still years away. In fact it may never be realized. The control system of a



FLOAT SWITCHES and electric motor valves are necessary items for automatic tank batteries, which are being used more and more in producing operations.

modern refinery or other oil-processing plant may be centralized for coordination. But this is still far short of the push-button factory.

Most oil-processing engineers feel that such advanced development is neither practical nor desirable. The reasons:

. . . Raw materials, products, and product quality change.

. . . Technology advances.

. . . Throughput changes due to fluctuations of supply and demand.

. . . Equipment deteriorates and becomes obsolete.

These factors will give rise to operating-control decisions that must be made by men, not automatic equipment.

Nonetheless, automatic equipment has been widely accepted in the refining business. And use of automatic controls is constantly increasing.

Refining evolution . . . The first control system in the refining industry consisted of an operator, a gage, and a valve. The operator continually adjusted the valve by hand as he watched the gage. Each plant required many operators.

The next step was installation of a self-actuating valve. It controlled the operation within comparatively wide limits. A separate controller later made the process more precise.

This instrument interpreted a signal from the measuring device and then positioned the control valve.

Later certain controllers were designated as master controllers. These automatically changed temperature, pressure, flow, and liquid level demanded by other controllers which indicated changes in feed or product.

Cycle timers were developed to change conditions automatically at certain times.

The latest step in this direction is development of continuous stream analyzers. They continuously sample process streams, analyze them, and automatically adjust the unit's master controllers.

Refining almost daily becomes more automatic. Yet for the foreseeable future, there will be a streamlined, highly skilled operating crew on duty around the clock at each process unit.

Automatic data logging . . . Constant checking and periodic recording of each of the many functions in the processing unit can be achieved with the new automatic data logging system. The result is elimination of "operational rubber," that portion of equipment investment lost in off-control operations.

Improvements with automatic data logging are little short of spectacular. Output can sometimes be increased as much as 10 per cent. Higher throughput is possible. Better products result, and the over-all operation is safer.

Automatic data-logging may not prove economical for some installations. But an automatic scanning system seems practical in almost all cases.

Analog computers . . . Still another recent development which promises to increase the usefulness of automatic control is the analog computer which analyzes the control system. It is possible to analyze equipment even in the design stage.

The control system is simulated by electrical circuits. Transfer lag, dead time, and valve hysteresis can now be duplicated in the simulated system. Components which tend to cause instability are spotted by the computer, and characteristics can be modified to eliminate the trouble.

Optimum settings for each response under various process conditions can be worked out in a few hours, and many hours of trial-and-error procedures are saved.

Electronic controllers . . . Several units in some new processing plants use all-electronic automatic controllers instead of the compressed-air type. Advantages claimed for these systems include more precise control, reduction in first cost and maintenance, smaller control rooms, and smaller operating forces for the units.

But there are also disadvantages: Danger of fire or explosion in hazardous areas, and loss of control in case of power failure.

The best indication is that all-electronic systems will be used more and more. Still there will always be a great many applications for pneumatic systems.

Multiplying, integrating, and differentiating functions also can be added to electronic controllers. This is a necessary step if some process units are to be operated by computers.

PRODUCTION

There will be a substantial increase in automatically controlled operations in production. These operations fall into four main categories:

Tank switching.

Well testing.

Well-production control or time-cycle well control.

Automatic transfer of custody to pipeline.

Tank switching . . . This equipment consists simply of float switches, a rotating selector and similar devices. Automatic controls fill a tank, switch production to another, and block the flow of additional production while it is on pipeline.

There are several such installations now in operation, and they should become more widely accepted as time goes on.

Well control . . . An automatic well-control system will:

Produce a well according to its allowable.

Keep a uniform flow into gasoline plants by rotating wells throughout the day.

Help reduce the gas-oil ratio by producing oil in time cycles so that the maximum amount of oil is produced for the least gas.

Reduce power costs on beam-pumped wells which are electrically operated.

by distributing the over-all power load more evenly during the day.

Well testing . . . This is a fertile field. Only the producer is involved, and he may test the well any way he pleases.

The operation simply invloves periodical testing for volume of oil, gas, and water that a well will produce. The well will go on test, be tested, come off test, and another will be switched on without any hand operations.

The result will be a reduction of manpower requirements, better and regular tests.

Automatic custody transfer . . . There are four methods to accomplish automatic transfer of custody: by adding a small dump tank to the usual lease-tank battery, installing a two-tank system, using a metering system to pass crude into the pipeline through a positive-displacement meter, and using a weighing system. What is needed is a rugged, cheap, accurate meter and a sound method of quality control.

Veteran production men seem to prefer the dump tank. A definite, known volume of oil is represented each time the tank is pumped out.

Production departments don't agree at this time on the advisability of employing the electronic instrument men necessary to automatic operations.

EXPLORATION

Most observers believe that a world of new possibilities is being opened up for automation in exploration. Perhaps the most likely candidates for automatic operations are in electric log studies, detailed sedimentary studies, and in analyzing and correlating geophysical data.

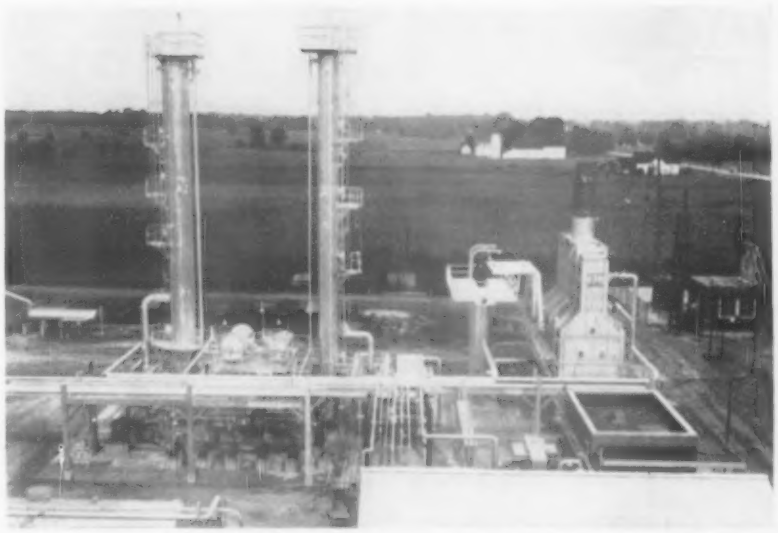
Electric-log work . . . It has been shown that it is possible to correlate electric logs by means of punched cards and statistical analysis. The process is laborious and time-consuming. But recording electric logs on magnetic tape would simplify and speed the handling process tremendously.

Punch-card methods have been used for analyzing the complex Seeligson field, where 59 different zones are producing.

Magnetic logs could be correlated directly by electronic machines, eliminating the punch-card step.

Automation would be invaluable in facies studies where a large amount of geological data must be analyzed. Sand-shale ratios, net sand thicknesses, and number of sands could be recorded automatically from electric logs. The geologist could analyze the data from maps.

The long hours normally spent in the tedious tasks of gathering data could be put to more profitable use in oil-finding.



FIRST REFINERY UNIT in the United States to be completely controlled with electronic instruments is this Platforming unit at Rock Island Refining Corp., Indianapolis.

Geophysical work . . . The use of magnetic-tape recordings may be paving the way for automatic correlation and analysis of seismic records. Gravity data, in particular, lend themselves to statistical analysis. Here machine computers handle in a few hours intricate calculations that would keep a pair of experienced men busy for months.

But there is a definite limit to automation in exploration. Most observers emphasize the need for human interpretation. Routine work can be handled by electronic brains. But in the final analysis, it is the geologist or geophysicist who must make the well location or recommend the buying area.

DRILLING

Automation appears to have less application to drilling than any other phase of the oil industry. But various automatic or semiautomatic devices will find increasing use.

The most important ones are automatic bit-weight controllers, torque indicators for the rotary table, pit-level gages, position indicators for the traveling blocks, and weight indicators.

There will also be a wider use of power equipment—power slips, power tongs, pneumatic controls—to reduce the fatigue of drilling crews. Adoption of semiautomation in drilling, limited as it will be, will effect few labor economies but will reap great benefits in efficiency and safety.

WHAT LIES AHEAD

Thus far, automation has been an unmixed blessing to the oil industry, without the bogey-man aspects which have caused concern elsewhere. It is being retarded somewhat by the inertia which invariably greets anything so revolutionary.

On the other hand, automation is finding ready acceptance by many as soon as technological advances clear the way. Automatic operations, though some 20 years old in the industry, are just getting out of their swaddling clothes. They are believed to be on the threshold of a genuine boom which should see them grow by leaps and bounds.

By 1965, automation could well account for 20 to 25 per cent of total investment in processing, industry experts believe. Pipeline and production outlays for automation are expected to double—from about 5 per cent of total investment to 10 per cent.

Drilling and exploration should experience similar increases. Expenditures for automatic drilling devices will amount to 2 per cent, according to industry forecasts, and exploration will rise to 2 to 4 per cent.

The degree to which automation is ultimately adopted throughout the industry will be governed by one formula: Automatic controls will continue to take over jobs now performed by men until the extra costs incurred are no longer offset by efficiencies gained.

But the electronic brains, brilliant as they are, are no wiser than the men who conceived them. They can perform only what they have been designed to do. They cannot make judgment decisions arising from new situations. Men will continue to control the plants and their operations, no matter how far automation ultimately goes.

Harris Bill Hopes Dim

Support from Eisenhower needed to save bill; consumer agitation, talk of gas-industry probe slow action on issue

WASHINGTON.—Fate of the Harris bill is becoming shaky. It still has a long way to travel in the little more than a month left in the 1955 session of Congress.

The bill to exempt independent gas producers from Federal Power Commission regulation has cleared only one of four hurdles in 3 months since it first was taken up.

The House interstate commerce committee has approved the bill, although by only a one-vote margin. The measure still must face a test on the House floor. Then it will have to clear the Senate interstate commerce committee and finally the Senate itself befor it can be sent to the President.

Added up, this could mean that producers of natural gas will not be freed from FPC price control this year.

Eisenhower key . . . Congressional leaders are not too optimistic about the bill's chances. House Speaker Sam Rayburn of Texas, a strong supporter of producer exemption, sees little chance of passage unless President Eisenhower actively pushes the bill. It will take the "endorsement and power" of the administration to put it across, he said. But there has been no indication from the White House that the President will pick up what is becoming one of the hottest potatoes handed Congress in a long time.

Other congressmen backing the bill believe a cooling-off period to let the dust of consumer opposition settle would be helpful. They point to the strong propaganda against the measure by consumer interests, and the "confusion" they say it has caused in and out of Congress.

Talk of probe . . . Investigations of the national gas industry proposed by Reps. Oren Harris of Arkansas and Charles A. Wolverton of New Jersey also might prove a barrier to quick action on the bill.

Harris wants an investigation of transportation and distribution to show the blame for high consumer rates lies with pipelines and distributing companies rather than with the producers. Wolverton agrees that this is desirable but wants the investigation also to go into production costs. When the matter came up before the House rules committee last week, Wolverton asserted that not a single producer appeared during the hearings on the Harris bill and the interstate commerce committee has no facts concerning producer ownership and control or producer costs.

The inquiry would be handled by the commerce committee and could cost up to $1,000,000. It would cover the whole industry. It would go into factors which Harris said, and Wolverton agrees, may be responsible for higher-than-necessary consumer rates.

Also subject to study would be the relationship between pipeline companies, holding company arrangements, transportation and distribution practices, etc.

Although Harris told the rules committee there is no direct relationship between his bill and the probe, it generally was agreed that if the inquiry is made the House would want to see its results before voting on the producer-exemption bill. Rayburn gave his support to the investigation, but at the same time he said no date has been fixed for floor action on the Harris bill.

Additives Flunk Tests

WASHINGTON.—There is no perfect anticorrosion additive for aviation fuels.

Tests on 32 products submitted by the industry to the Naval Research Laboratory showed that none met all requirements. Several "promising" inhibitors were found. But it was concluded that the choice of inhibitors must be based on a compromise after evaluation of their relative shortcomings.

The addition of oil-soluble corrosion inhibitors to fuels at the time of manufacture is the best way to protect pipelines and other fuel-handling and storage equipment, the laboratory said in a report on the study.

Tests on the 32 products included the determination of ferrous-corrosion inhibition activity, water extractability, fuel solubility, ash content, water tolerances, and compatibility with gum inhibitors, ignition modifiers, gasoline dyes, and other inhibitors.

The report, PB 111624, "An Evaluation of Corrosion Inhibitors for Use in Aircraft Fuels," is being distributed through the Office of Technical Services, Department of Commerce, Washington 25, D. C. It sells for $1 a copy.

Pipeline Due Check

Navy-industry board will survey Spanish project

WASHINGTON. — A joint Navy-industry board of review will go to Spain shortly for an on-the-ground study of design and engineering for pumping stations along the new military pipeline there to make certain they conform with accepted industry practices.

The board will submit its report and any suggestions before any contract for building the stations is let. Contract for building the line itself was made last month and contracts for storage tanks are now being firmed up.

The 485-mile, 8-10-in. line will run from Cadiz to Zaragoza by way of Madrid, carrying fuel from the seaport to six United States air bases at Rota, San Pablo, Moron, Torrejon, Valenzuela, and San Jurjo.

The $4,956,000 low-bid, joint-venture contract for building the line was awarded to Merritt, Chapman & Scott Corp., New York; Benson and Montin, Oklahoma City; and Agroman Empresa Construction of Madrid. They are subcontractors from Brown-Raymond-Walsh, prime contractor. This latter combine is a joint-venture group composed of Brown & Root, Inc., Houston; Raymond Concrete Pile Co., New York; and Walsh Construction Co., Davenport, Iowa.

The line will have seven diesel pumping stations, with all-American equipment. They will be capable of handling multiproduct movement which can be reversed if necessary.

The Bureau of Yards and Docks, Navy Department, is handling the project for the Air Force, which will operate the line. Before the contract for the stations is let, the bureau wants to make sure the line will be adequate, representative of the best engineering practice and economically built.

The review board will include experienced men from the oil industry as well as a bureau representative. It will study the detailed design of the stations, of centralized control and dispatching facilities, and of communications systems and equipment.

Pipe for the line was bought on competitive bids from the British firm of Steward & Lloyd. Construction is to be finished late next year.

Compact Curb Voted

House softens amendment requiring monopoly check

WASHINGTON.—The House interstate commerce committee last week approved a 4-year extension of the Interstate Oil Compact. The measure already has passed the Senate.

House Committee Chairman J. Percy Priest of Tennessee said he will ask the rules committee to clear the bill for early vote on the House floor.

Before acting on the bill, the House committee rewrote one Senate amendment. It would require the attorney general to report annually to Congress on workings of the compact.

The report would state whether state actions have "resulted in stabilizing or fixing of prices of oil or gas, creation or perpetuation of any monopoly, or promotion of any regimentation in production or sale of oil and gas."

The House version of this clause would require the attorney general to report whether activities of the states have been consistent with the purpose of the compact as laid out in Article V. That article states it is not the purpose of the compact to authorize member states to limit production to stabilize or fix price, create monopoly or promote regimentation.

House Cuts Tanker Funds

WASHINGTON. — The House and Senate disagree over the building of an experimental 20-knot tanker for the Navy and the trade-in-and-build program started last year.

The House turned down the plan to build a prototype tanker and halved the $21,000,000 asked by the Maritime Administration for the trade-in program. The Senate vetoed the cuts, but only after argument over whether the Navy was sticking to its original idea of building 18-knot tankers to replace slower wartime T-2 vessels.

Only one of the tankers contracted for so far will be an 18-knot vessel, it was charged by Sen. John J. Williams of Delaware. But Sen. Leverett Saltonstall of Massachusetts said that Esso Standard Oil Co. was to build an 18.3-knot ship and The Texas Co. an 18.5-knot vessel. Two tankers to be built by the Gulf Oil Co. are scheduled to have a speed of 17 knots.

The Defense Department last year outlined a plan to acquire tankers with speeds of 18-20 knots with trade-in allowances for T-2's, which would be put in the reserve fleet. The department, it was brought out, has "reconsidered" and decided that any tanker with a speed between 16 and 20 knots would be satisfactory.

WATCHING WASHINGTON

Bertram F. Linz

Research Is Partnership

Bureau of Mines petroleum research is an industry-government partnership.

One-seventh of the money spent by the bureau on oil and gas studies comes from nonfederal sources. These include oil and gas producers' associations, private firms, private research organizations, state agencies and educational institutions.

One of the outstanding examples of industry cooperation is in northeastern Oklahoma, where an oil company has joined with the bureau in a study of the use of radioactive material to trace the course of water injected into a secondary-recovery pool.

An example of state participation is the petroleum experiment station at Bartlesville, Okla., for which the state has provided an annual fund ever since it was opened in 1918.

Among the interests joining with the bureau are the American Petroleum Institute, North Texas Oil and Gas Association, Western Petroleum Refiners Association, Arkansas Oil and Gas Commission, Well Surveys, Inc., and Ethyl Corp.

Lost: Many Refineries

"Operation Alert" was a make-believe attack on some 50 cities across the nation. But if the let's-pretend civil-defense exercise June 15 had been the real thing, the news dispatches might have read something like this:

"One-sixth of the country's refinery capacity has been put out of commission in a dozen cities hit by enemy atom bombs. In these and other centers attacked large volumes of oil in terminals and primary and secondary storage also were lost.

"Many refineries were destroyed. Others were damaged by blast or fire. Still others more remote from the points of impact were put out of commission by radioactive fallout."

As reports of the mock assault filtered into Secret Headquarters to which the top level of Government had moved from Washington, it was not a pretty picture. Six per cent of the nation's industrial capacity had been wiped out. Another 10 per cent had been damaged. Fifteen million persons had been killed or injured. Damage would have been worse but for the fact that the atom bombs were dropped on congested areas of the cities attacked.

The loss of refining capacity is easy to figure. Among the cities "hit" by atom bombs were Houston; Chicago; Gary, Ind.; Philadelphia; Cleveland and Toledo, Ohio; Buffalo, N. Y.; Los Angeles and Oakland, Calif.; Providence, R. I.; and Baltimore. These are important points of production for military as well as civilian supply. These cities and adjacent areas have more than 1,550,000 bbl. of refinery capacity.

U. S. Readies Law Suits

The two most important antitrust suits ever brought against the oil industry by the Government are expected to be ready for trial within a year.

One is the cartel suit, filed in 1953. It charges that American oil companies were part of an international group which split the world oil market among its members.

The other is the so-called West Coast suit, filed in 1950. The Government charges seven major companies and an oil association with monopolizing the oil industry in the western states.

This is a "divorce" action. The Government is attempting to force the companies to dispose of either their production or marketing activities. If successful it would be the springboard for a drive to break down all integrated companies into segments. This already has been done in the case of the motion-picture industry, where companies once owned production, distribution and exhibition facilities.

Plans for the suits were disclosed by Asst. Atty. Gen. Stanley N. Barnes in a letter to Rep. Emanuel Celler of New York, chairman of a House antimonopoly committee.

Barnes said the cartel suit is "far and away the most important action" the Government ever brought against the oil industry. The West Coast case, he said, is the "biggest and most complicated."

In the cartel suit the Justice Department has combed through 60,000 documents. Government lawyers still have more to review before the important case will be ready for trial.

Pipeline Hearing Set

Pacific Northwest's new plans to import Canadian gas will go before FPC July 18; El Paso Natural deal also involved

WASHINGTON. — The Federal Power Commission will open hearings July 18 on a three-way deal involving the importation of natural gas from Canada.

Subject of the hearings will be:

. . . **An application of Pacific Northwest** Pipe Line Co. for a presidential permit to import over 300,000,000 cu. ft. of gas daily from Alberta and British Columbia. This gas would be supplied by Westcoast Transmission Co., Ltd. *(The Oil and Gas Journal, May 30, page 50.)*

. . . **A request of El Paso** Natural Gas Co. for permission to buy 250,875,000 cu. ft. daily from Pacific Northwest *(The Oil and Gas Journal, May 23, page 83).*

. . . **An application of the** Nevada Natural Gas Pipe Line Co. to buy 30,345,000 cu. ft. daily from El Paso.

Pacific Northwest was authorized last June to build a $160,000,000 pipeline system to move gas from the San Juan basin in New Mexico and Colorado and fields along the route to market areas in Colorado, Utah, Wyoming, Idaho, Oregon, and Washington.

Pacific Northwest plans . . . The company plans to extend its system in Idaho and Washington and increase compressor station capacity by 11,340 hp. to handle 303,462,000 cu. ft. of gas to be imported near Sumas, Wash.

It will sell the greater part of this to El Paso at Mountain Home, Idaho, and use the remaining 50,575,000 cu. ft. to supply its new markets and for export to British Columbia at a point in Stevens County, Washington. Total cost of the project, including facilities previously approved is $175,493,000.

El Paso alternatives . . . El Paso is asking to make field exchanges with Pacific Northwest at wellhead connections in the San Juan basin up to 102,000,000 cu. ft. daily on a temporary basis, and to expand its system under any one of three plans it laid before the FPC.

One plan calls for construction to handle 505,750,000 cu. ft. daily from the San Juan basin and 50,575,000 cu. ft. from the Permian basin in West Texas and Southeast New Mexico. The company would deliver 70,805,000 cu. ft. daily to its customers in Texas, New Mexico, and Arizona. It would sell 227,588,000 cu. ft. daily to Pacific Gas & Electric Co., and an equal amount jointly to the Southern California Gas Co. and Southern Counties Gas Co. of California. Another 30,345,000 cu. ft. would be sold to Nevada Natural. Cost of the project is estimated at $184,750,000.

The second plan calls for construction to handle 252,875,000 cu. ft. of gas daily from the San Juan basin, 50,575,000 cu. ft. from the Permian basin, and the purchase of 252,875,000 cu. ft. from Pacific Northwest.

Pacific Gas & Electric and the two other California gas companies would buy 202,300,000 cu. ft. of the domestic gas and would take the imported gas at a point on the Nevada-California boundary near Reno, Nev. Sales to Nevada Natural and El Paso's own customers would be the same as under the first plan. The cost would be $200,742,000.

The third proposal is the same as the second except that instead of taking the imported gas at Mountain Home and delivering it near Reno, El Paso would take it near Pendleton, Ore., and deliver it to the California companies on the California-Oregon boundary near Klamath Falls, Ore. This plan would cost $195,528,000.

Nevada Natural would build 114 miles of loop line and 26 miles of sales laterals and extensions to move the gas to be bought from El Paso for sale to the Nevada Southern Gas Co., California-Pacific Utilities Co., and additional industrial customers.

U. S. Wins Tanker Suit

WASHINGTON.—Two more postwar cases involving tankers bought from the Government by alien-controlled corporations in violation of the shipping laws were settled last week.

Atty. Gen. Herbert Brownell, Jr., announced the Government will collect $1,400,000 in settlement of civil cases against the Seatrade Corp., Seatrade Corp. of Delaware, Aegean Marine Corp., Tramp Shipping & Oil Transportation Corp., Philadelphia Marine Corp., Petrero Corp., and Cienega Tanker Corp.

The department charged these corporations were controlled by Manuel E. Kulukundis, a Greek citizen, and related companies.

Only one recovery suit still pending as a result of the seizure of 43 vessels allegedly acquired illegally by aliens. It is against the group of companies controlled by A. S. Onassis. Suit has been brought in the New York federal court to recover 22 ships bought by the Onassis group and recoup the profits from the operation.

WEST COAST

Products Line Started

First section of Southern Pacific's 846-mile carrier under construction; other work slated to begin soon

LOS ANGELES. — Construction has started on the first section of the 846-mile products carrier Southern Pacific Pipe Lines, Inc., is building between Los Angeles and Phoenix, Ariz., and between Phoenix and El Paso, Tex.

First pipe was laid early this month near Lordsburg, N. M. By mid-June more than 37 miles of the 8-in. El Paso-Phoenix line was underground. Work on additional schedules will start during July and August. The line will be completed before the end of the year.

The $30,000,000 carrier will be unique in that it largely is to follow right-of-way of the Southern Pacific Railroad. It is that company's answer to its battle with truck-transport companies in supplying petroleum products to the Arizona market. It will deviate from the right-of-way where economical short cuts are possible.

Construction schedule . . . Construction contracts on the eight schedules total about $5,000,000. All except the 61-mile leg between Los Angeles and Colton, Calif., have been let. The schedules include:

. . . **Schedule 1,** 158 miles of 8-in. between El Paso and Lordsburg, under construction by Morrison-Knudsen Co., Los Angeles.

. . . **Schedule 2,** 145 miles of 8-in. between Lordsburg and Tucson, contracted to R. H. Fulton & Co., Lubbock, Tex. Work will start about July 12.

. . . **Schedule 3,** 122 miles of 8-in. and 35 miles of 12-in., Tucson to Hassayampa via Phoenix, contracted to Hood

Construction Co., Lynwood, Calif. Work will start about August 15.

. . . **Schedule 4,** Hassayampa to Yuma, 128 miles of 12-in., let to Macco Corp. and Alex Robertson Co., Paramount, Calif. To start about August 1.

. . . **Schedules 5 and 6,** Yuma to Colton, 197 miles of 12-in., let to Conyes Construction Co., San Pablo, Calif.

. . . **Schedules 7 and 8,** Colton to Watson in Los Angeles refining area, 61 miles of 16-in., contracts not let.

Pumping stations, which will cost about $25,000,000, will be built at Watson, Colton, and El Paso. At Watson three motor-driven, 300-hp., centrifugal pumps will have a designed throughput of 39,000 bbl., with a future capacity of 58,000 bbl. daily. At Colton three 900-hp. units will have an initial of 28,000 bbl. and a planned capacity of 38,000 bbl. At El Paso two 300-hp. units will pump 13,000 bbl. initially and 21,000 bbl. when enlarged.

SOUTHWEST

Gas Input Sought

Cities Service plans Strawn limestone recovery project

IRAAN, Tex.—Cities Service Oil Co. is planning a high-pressure pilot gas-injection project for the Strawn limestone in World West field in Crockett County, West Texas.

Planned input will total 1,000,000 cu. ft. of gas daily at 4,000 psi. Injection will be through a lone input well high on the structure. The pressure is the same used in Atlantic Refining Co.'s highly successful pioneer operation in Block 31 Devonian field of Crane County to the northwest.

If the pilot works out as expected, it likely will be extended via unit operation from the presently planned 240 acres to include the reservoir's entire 1,300 acres. Cities Service thinks that high-pressure gas injection will hike ultimate oil recovery by 59 per cent. That will mean an additional 1,000,000 bbl. or more of oil from the Strawn.

World West was discovered in March 1954. There are now five wells in the field completed on an 80-acre spacing pattern. It is a solution-gas reservoir with no gas cap.

Gas-oil ratios have remained constant so far at 2,000:1 but a sharp upward trend is anticipated.

Company engineers estimate original oil in place in the field at 10,500,000 bbl. Primary operations can recover about 16.4 per cent of this. Cities Service believes that pressure maintenance at or near saturation conditions will recover 26.1 per cent of the oil in place. Saturation pressure is 3,438 psi.

Cities Service is seeking approval of the project by the Texas Railroad Commission.

Humble to Build New Plant

IRONTON, Tex.—Humble Oil & Refining Co. will start construction July 1 of a natural-gasoline plant near here in the new Neches Woodbine field.

The plant will have a gas-processing capacity of 11,000,000 cu. ft. a day and a liquids production of about 53,000 gal. a day. It is located on a 33-acre tract in the field in Cherokee County, East Texas. Gathering lines which will pipe the gas to the plant already have been laid.

Big Drilling Barge Tips Over In Gulf

NEW ORLEANS.—Salvage operations were under way last week on the $2 million drilling barge Anastasia, which capsized June 17 on location 2½ miles from the Grand Isle coast. Its 43 crewmen and workers jumped into the gulf and escaped without injuries.

The barge is owned by American Tidelands, Inc., and had completed its first drilling job for Humble Oil & Refining Co. just prior to the accident. The craft was christened February 13.

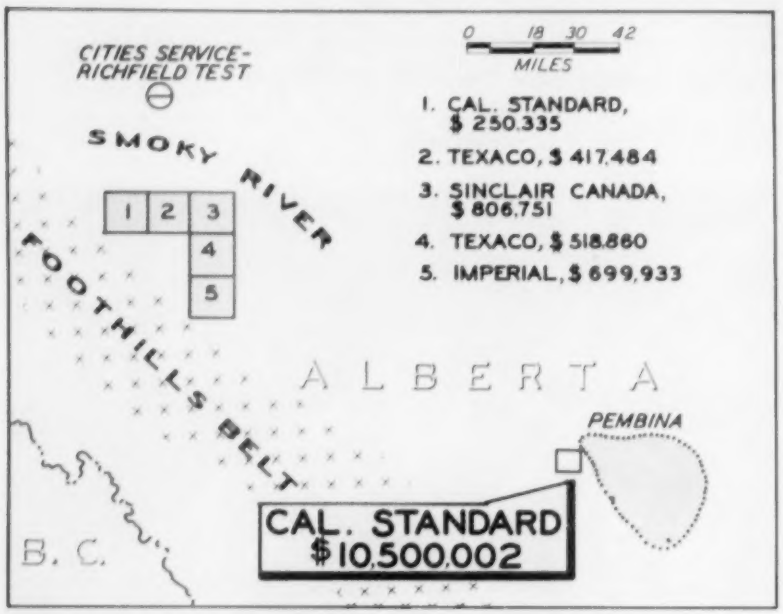
Workers were in the process of refloating the barge to move to new location. Repairs also were under way on the barge at the time.

A sea diver, Buck Frolich, said he had just come up from patching leaks under water when the barge started to tip over about 4 a.m. It turned over on its side at 4:45 a.m., giving sleeping workers time to abandon ship.

Edmund H. Crane, secretary-treasurer for American Tidelands, said the barge must have been raised slightly off the floor of the gulf entirely or one side was raised. He said the rig could not have tipped if it were resting securely on the gulf floor.

In refloating the barge, one end is raised at a time by pumping water ballast out of tanks. The barge is 200 ft. long and 75 ft. wide with a 30-ft. superstructure.

The men aboard included a cooking and cleaning crew, repairmen from Alexander Shipyard, and a few American Tidelands personnel. More than half of the crewmen were asleep in air-conditioned quarters of the ship when aroused. The men leaped from the side or scrambled down ropes to rough waters of the gulf. They were picked up by rescue boats.



Alberta Play To Shift

Leasing shows exploration will swing to Foothills Belt area; tract near Pembina brings top bid of $10,500,002

EDMONTON.—The exploration spotlight in Alberta is shifting from the Pembina area to the Foothills belt region near the western edge of the province.

This swing westward was evident earlier this month when Alberta held a Crown Reserve lease sale. Five tracts in the rank-wildcat territory of the Foothills were leased. Each tract covered 92,160 acres or four townships.

Even though most of the wildcatting may center in the Foothills, the big money is still going for leases in the promising Pembina area. The largest bonus by far was $10,500,002 laid out by California Standard Co. for a 92,160-acre tract 15 miles west of the main development sector of Pembina.

But the operators showed they have big hopes for the Foothills. The five successful bidders paid more than $2.5 million for the tracts. All are in the Smoky River area.

The second highest bonus paid at the sale was $806,751 paid by Sinclair Canada Oil Co. for one of the Smoky River tracts. Texaco Exploration Co. snapped up two tracts with bids of $518,860 and $417,484. The other two tracts in Smoky River went to Imperial Oil, Ltd., for $699,933 and California Standard for $250,335.

There is no production in the Smoky River area. The only activity in the area is a 13,000-ft. wildcat being drilled by Cities Service Oil Co. and Richfield Oil Corp. The test is about 25 miles north of the area leased. The operators are nearing 9,000 ft. on the wildcat.

Socal's tract . . . The high-priced tract leased by California Standard is immediately west of the $13-million tract leased in January 1954 by Texaco. There is one producer in the Texaco tract. Immediately north of Texaco's block, Imperial has drilled several dry holes on a tract they leased for $11 million. Both the Texaco and Imperial blocks are on the northwestern edge of Pembina field.

Other leasing . . . The only other wildcat area leased was a 37,920-acre tract in the Crow Indian Lake Provincial Reserve in the southern section of the province. Canadian Fina Oil, Ltd., leased this area with a bonus of $9,675.

The Alberta treasury realized $27,301,407 from the sale. There were 75 parcels covering 612,430 acres leased at the sale.

The 28 parcels covering proven and semiproven acreage in Pembina field brought $10,988,306. Four companies accounted for two-thirds of the total paid for the Pembina tracts.

California Standard paid the most for Pembina acreage. The company leased 1,552 acres for $2,339,045. Other big bidders in Pembina and the number of acres leased included: Seaboard Oil Co., 1,122 acres for $2,215,731; Canadian Bishop Oil, Ltd., 960 acres for $1,212,990; and West Provincial Development, Ltd., and Hudson's Bay Oil & Gas Co., 800 acres for $1,050,400.

One other company paid more than $1 million for acreage at the sale. Shell Oil Co. paid $1,006,275 for 960 acres in the South Sturgeon Lake area.

Canadian Briefs

SARNIA, Ont.—Polymer Corp. is planning to add 7,000 tons per year to its synthetic-rubber capacity to meet a record demand for automobile tires and other end uses in Canada. The rising price of natural rubber, plus an unprecedented demand and unforeseen boom in rubber demand has placed a load on the country's primary source for synthetic product. Polymer takes light-hydrocarbon gases from Imperial Oil Ltd., Canadian Oil Companies Ltd., and Sun Oil Co. Ltd. in this area.

MILLHAVEN, Ont.—Canadian Industries (1954) Ltd. will begin construction immediately on a 200-ton synthetic anhydrous ammonia plant adjacent to its Terylene plant here. The firm will ship ammonia to Beloeil, Que., where capacity for making nitrogen solutions will be expanded. The new plant will derive its hydrogen from heavy fuel oil, using a synthetic gas-generation process developed and licensed by Texaco Development Corp. The process employs the partial-oxidation principle.

TORONTO, Ont.—Imperial Oil Ltd. is expanding underground L.P.G. storage at Sarnia, Ont. The company now has two caverns with a total capacity of 90,000 bbl., and will expand them to 120,000 bbl.

OTTAWA.—The House of Commons has approved in principle a bill which would incorporate Consolidated Pipe Lines Ltd. The bill already has Senate approval. The company operates a number of small gas and oil feeder lines in Alberta. It plans to construct lines between eastern Alberta and western Saskatchewan.

Oil Compact Expands

Commission welcomes four new members, adds services, hears predictions of more reserves, petrochemical boom

Henry D. Ralph

DENVER.—The Interstate Oil Compact Commission at its summer meeting here:

... Welcomed as new members the states of Wyoming, South Dakota, Nevada, and Arizona.

... Enlarged its budget and reorganized its activities to extend its services.

... Heard papers by recognized authorities on the future world supply and demand for energy, application of atomic power, development of a shale-oil industry, and prospects for the petrochemical industry.

... Conducted an all-day symposium on the significance of fluid-injection operations in the United States. It will be published later as a pamphlet.

... Completed a state-by-state report, requested by the Department of Defense, on possibilities for underground storage of liquid petroleum and products.

... Revised its model state conservation statute form.

... Virtually completed drafting an engineering guide book on conservation and production practices.

... Conducted a symposium on improved methods for properly plugging abandoned wells.

... Heard several speeches by state governors and others on the value and effectiveness of oil and gas conservation.

... Called for a reduction in imports of foreign oil.

From the standpoint of the Compact Commission itself, the most important business was adoption of the report of a special committee on policy, administration, and activities. This report summarized suggestions for improving the work of the compact. It recommended expanding the scope of the commission in various ways, including:

... An expanded library in the headquarters office to facilitate research on conservation.

... Creation of an educators' committee to encourage the study of technical, legal, and economic aspects of conservation in colleges and universities.

... Holding annually two meetings of 3½ days each in order to spread out committee meetings.

... More open-forum discussions and consideration of controversial subjects even though they may not have the endorsement of the commission as such.

... Publication of more pamphlets and papers on various aspects of conservation.

Increased reserves . . . The crude-oil reserves of the United States which are economically recoverable are close to 40 billion barrels instead of the commonly used estimate of about 29 billion, the compact's committee on secondary recovery and pressure maintenance reported as the result of a state-by-state survey covering several years.

The report was presented by Paul D. Torrey, committee chairman. He said that fluid injection under presently economic conditions will recover 11 billion barrels of oil in addition to primary reserves. A total of 29 billion could be recovered by injection if economical. (For more details on this report see "Exploration," page 153).

At the same symposium on fluid injection, Albert E. Sweeney, Jr., director of the compact's secondary-recovery division, reported that fluid injection of all types produced approximately 425,000,000 bbl. of oil in 1953 and that fully unitized projects produced 208,000,000 bbl. in 1954.

Petrochemical boom . . . The petrochemical industry by 1975 will be five times as large as at present, but even so it will consume only about 6 per cent of the nation's petroleum and natural-gas production, including the fuels needed to make chemicals, it was forecast by Dr. Carl O. Tongberg, vice president of Esso Research & Engineering Co.

Tongberg said petrochemicals are no longer a byproduct but are now one of the main objectives of petroleum processing, and petrochemicals now represent about 80 per cent of all organic chemicals produced in this country. The actual chemicals use only 1 per cent of total crude and natural-gas production, but the fuel used in making them raises the consumption to 3 per cent.

Early conservation needed . . . Time is the most important element in conservation, and unless conservation begins when a pool is discovered the industry may be open to the charge that it is not taking conservation seriously, the commission was told by Herman H. Kaveler, management consultant, Tulsa.

In an address prepared for the engineering committe and which attracted wide attention at the commission meeting, Kaveler said that the "rule of capture under which oil is produced in the United States is similar to the theory of robbery or piracy and defeats the objective of conservation."

His remedy was unit operation of an oil pool at the beginning of its development.

In almost everything except oil and natural gas, Kaveler said, conservation of natural resources is in the self-interest of the owners and producers, and there need be little public concern over waste. People ordinarily do not produce their iron ore or other resources faster than there is a market for them because there is no profit in doing that, he pointed out, but because oil and gas flow across property lines there is a profit in producing them too fast and therefore the public is justified in enforcing conservation measures.

Demand proration not enough... However, Kaveler warned against putting too much dependence on market-demand proration alone as a means of preventing waste. Merely postponing some production and preventing above-ground waste may constitute wise use but may not necessarily lead to maximum recovery, he pointed out.

"The petroleum producing industry must struggle with the problem of waste prevention," Kaveler said. "When it does, it must face the question, 'When does waste prevention begin?' The only logical answer is that waste prevention must begin in the beginning.

"If the industry is to claim that it is serious about waste prevention in the production of petroleum it must admit that waste prevention begins with the drilling and first production of the discovery well in any common source of supply. Conservation cannot be accomplished in a serious vein if waste prevention starts when the pool is developed, or half developed, or when the pool is half depleted, or depleted.

"One might go so far as to observe that waste prevention might begin even at the early time when an operator acquires a lease. Waste prevention might be such a serious policy of the indus-

try that a person might be aware of the fact that the lease he purchases, if it is found to be underlain with recoverable oil or gas, does not confer a right to produce the oil or gas as the individual operator might desire.

"If conservation were taken that seriously an operator might gage his conduct accordingly and take steps in respect to investment in and operation of his property such that he found himself able to live and exist under whatever waste-prevention policy might reasonably be imposed upon him as a producer."

Kaveler concluded that the only way to make it profitable not to waste oil and gas in their production is by unit operation so that everyone with a property interest in a pool has a financial interest in seeing that none of the common supply is wasted.

Shale-Oil Future Bright

Union Oil building first commercial plant in Colorado, says products can compete with crude on West Coast

DENVER.—Union Oil Co. has started work on its first commercial-scale oil-shale retort on Parachute Creek, Colorado. Company officials believe that products refined from shale oil can be sold on the West Coast competitively at present prices of crude oil.

This was announced by A. C. Rubel, vice president of Union, in an address to the Interstate Oil Compact Commission. He said that in excess of 100 billion barrels of easily recoverable liquid fuels from oil shale may be competing on the market with crude oil within a few years.

The Parachute Creek plant will have a capacity of 1,000 tons of shale per day, which Union believes is the best commercial size. It will be the same design as the company's successful 50-ton pilot plant. This will permit further studies of mining and retorting methods and costs, and will provide quantities of crude shale oil for refining experiments.

What are costs? . . . Rubel did not indicate how fast Union may go with development plans, but he said:

"An installation including mines, retorts, coking and hydrogenation facilities, byproduct recovery, and utilities to produce 40,000 bbl. per day of crude shale oil would represent an investment at present labor and material costs of approximately $75,000,000.

"A pipeline of 50,000 bbl. per day capacity from Rifle, Colo., to Los Angeles, a distance of approximately 815 miles, designed to transport the semi-refined, hydrogenated material, is estimated to cost $56,000,000.

"At these figures, the material could be produced and delivered to the Los Angeles market at a cost competitive with current crude prices, allowing reasonable rates of interest, depreciation, and profit."

Processing . . . Under the method proposed by Union, the crude shale oil from the retorts would be partially processed near the mine site before being piped to a refinery.

The crude shale oil would first be coked. Then the coke distillate would be hydrogenated to remove sulfur and nitrogen and to improve the quality of the product. The resulting material would be a high-grade gas oil which could be shipped to the West Coast for conventional refining.

At the mine site, the products to be disposed of would be excess fuel gas, sulfur, ammonia, and large quantities of coke suitable for metallurgical purposes.

Vast reserves . . . The Parachute Creek retort will be supplied by a mine in the Mahogany Ledge deposit of shale near Rifle in the Green River basin of Colorado. Rubel said the Mahogany Ledge ranges up to 100 ft. in thickness and averages 30 gal. per ton of recoverable shale oil. This represents a commercially recoverable reserve of 100 billion barrels.

If crude shale oil is produced at the rate of 1,000,000 bbl. per day, he said, the Mahogany Ledge could supply 12.5 per cent of present domestic consumption of petroleum for 275 years.

Shale oil also can compete on a cost basis with solid coal, liquid fuels from coal, natural gas, or nuclear energy.

"It can compete with crude oil," he said, "because in the principal available markets, namely the Pacific Coast, the outlook is for the immediate necessity of supplementing current crude supplies from outside sources. Present estimates of the cost of production of liquid fuels from oil shale delivered to the market area indicate these products will be competitive with products from either imports or domestic production at current prices.

"I believe it can be stated, from the best information available, that the cost of producing liquid fuels from oil shale will increase at a much lesser rate than that from natural crudes, at least within the United States."

Shell Completes New Products Line

A 65-mile, 12-in. products line has been completed in Louisiana by Shell Pipe Line Corp. The concrete-coated line, with a capacity of 50,000-bbl. daily, will carry products from Shell Oil Co.'s expanded 75,000-bbl. refinery at Norco, La., to a junction with the Plantation Pipe Line near Baton Rouge. Products will then be shipped to the southeastern states. Crews above work from an island of heavy timbers in laying the line across 12 miles of treacherous swamp. The heavy timber supports were laid on the bog, then pipe was pushed as far as possible along the ditch in either direction.

Big Line Contracted

Work to start soon on gas line from gulf to Detroit

DETROIT.—American Louisiana Pipe Line Co. has awarded construction contracts for its 1,004-mile, 30-in. line from North Tepetate, La., to near Detroit.

Included in the awards was the biggest pipeline contract let in about 2 years. H. C. Price Co., Bartlesville, Okla., and Houston Contracting Co., Houston, were awarded a contract covering 783 miles of the natural-gas line. It is the largest single contract let since the two firms were awarded the Gulf Interstate Gas Co. pipeline project in 1953.

Brown & Root, Inc., Houston, will build the remaining 30-in. portion of the line. This section extends south from the Arkansas - Louisiana border. Brown & Root's contract also covers two short 24-in. gathering lines from North Tepetate.

The only section of American Louisiana not contracted is a 117-mile, 22-in. spur from Payne, Ind., to Bridgman, Mich.

Construction will probably start early in July. About half the line will be laid this year. The job will be completed next summer.

Price will have two spreads in the field. One will start at the Hancock-Henry county line in Indiana, working south. The other will start at Slaughters, Ky., working north. Price plans to lay 185 miles of pipe this year.

Houston Contracting also will work two spreads. One will start working south from Detroit and the other north from the Hancock-Henry county line. The company will lay 215 miles this year.

Patent Suit Figure Raised

NEW YORK.—The stakes have been raised in the Houdry-Socony patent-infringement suit.

Houdry Process Corp. has amended its suit filed February 27, 1953, and now seeks damages from Socony Mobil Oil Co., Inc., totalling $52,733,464 instead of the $21,700,000 originally asked.

The action involves two moving-bed catalytic cracking processes, both employing a vapor-lift catalyst system. Houdry's process is called Houdriflow and Socony's Thermofor catalytic cracking (T.C.C.).

Houdry claims that Socony is violating contract, infringing Houdry patents, and has cost the company money by competing in licensing the process. According to Houdry, it is asking damages amounting to $37,787,500 for the T.C.C. licenses sold by Socony, $9,421,044 for reductions suffered by Houdry because Socony lowered its licensing fees, and $5,564,920 for Houdry losses arising from reduction in royalty rates initiated by Socony.

Socony was a one-third owner of Houdry until it sold its interests in 1950. Shortly before that time, the Houdriflow and air-lift T.C.C. processes were announced. The case is moving toward trial in Philadelphia, with both sides nearly finished taking depositions and assembling documentary evidence and exhibits.

Petrochemical Output Increases

WASHINGTON.—According to preliminary figures released by the U. S. Tariff Commission, production of crude chemicals from petroleum and natural gas rose about 16 per cent in 1954. The total reported for 1954 is 12,941,383,000 lb. vs. 11,147,060,000 lb. for 1953.

On the whole, most of the petrochemical basics followed normal upward trends, but some stand out. The jump in both propylene tetramer (dodecene) and propylene trimer (nonene) reflects the rapid growth in synthetic-detergent manufacturing, and the expanding list of petroleum refiners who are making this basic chemical. Dodecene rose nearly 80 per cent over 1953, while nonene showed a 60 per cent jump.

The decline in butadiene output reflected a similar drop in synthetic-rubber output last year. Ethylene, one of the principal building blocks in petrochemical manufacture, marked up a substantial 10 per cent gain.

The current report shows a breakdown on methane for the first time, but the figure does not reflect all methane which is converted to ammonia, synthesis gas, methanol, carbon monoxide, and hydrogen. Some indication of the basis for this figure will be available this fall when the final report is issued, showing those companies whose production made up the 44-million-pound methane total.

Another first figure to be reported is ethyl mercaptan, with a 1954 output of 1,930,000 lb. In the aromatic picture, normal gains showed for all by mixed xylenes.

The accompanying table compares the current preliminary report with past years, so far as is possible. It should be noted that the change in bases prevents direct comparison of some individual chemicals.

CRUDE PRODUCTS FROM PETROLEUM AND NATURAL GAS FOR CHEMICAL CONVERSION

(Thousands of pounds per year)

	1954 (Prelim.)	1953	1952	1951	1950
Aromatics:					
Distillates and solvents	520,286	404,545	391,263	432,139	
Benzene	673,715	462,105	255,730	234,521	72,927
Cresylic acid, crude	21,576	16,080	14,317	20,386	16,080
Naphthenic acids	23,666	23,123	19,319	38,528	24,684
Toluene	889,687	836,473	463,650	403,327	329,122
Xylenes, mixed	726,041	749,010	443,804	464,416	449,587
Other	19,037	14,355	17,038	5,190	532,571
Total aromatics	2,874,008	2,505,691	1,605,121	1,598,507	1,424,961
Aliphatics:					
Methane	44,036				
Ethane	355,820	144,623	203,179	1,798,915	1,821,893
Ethylene	2,344,644	2,135,740	1,809,495		
Propane	1,675,124	1,366,175	580,139	973,561	998,842
Propylene and C_3 mixtures	1,203,501	1,222,622	996,282	1,148,454	694,047
1,3-Butadiene	808,731	1,152,197	1,106,445	1,222,411	610,056
n-Butane	459,196	418,144	37,856	1,136,188	641,072
Butylenes	1,214,756	906,732	825,171		
Isobutane	227,706	155,589			
Other C_4s	852,640	534,507	404,178	460,842	
C_5 hydrocarbons	179,395	122,048	15,401		
Di-isobutylene	21,997	23,157	25,325	21,670	20,044
Dodecene	316,337	176,926	114,983	93,510	
Nonene	98,557	60,986			
Derivatives		2,681	1,920		
Ethyl mercaptan	1,930				
Other	3,401				
Other aliphatics	259,604	219,242	141,409	152,804	336,625
Total aliphatics	10,067,375	8,641,369	6,261,783	7,008,355	5,510,100
Grand total	12,941,383	11,147,060	7,866,904	8,606,862	6,935,061

Source: Chemical Division, United States Tariff Commission.

Sonic Drill Versatile

Originally designed for hard rock, new tool also cuts soft formation; sound waves give percussive action to drill bit

LOS ANGELES.—Borg-Warner's new sonic drill, originally designed for hard rock, also will cut soft formations.

This is the report of A. G. Bodine, the tool's inventor. He told a petroleum branch meeting of the American Institute of Mechanical Engineers here that 2 years of extra test work has revealed the full range of the tool's cutting possibilities.

Bodine did not reveal detailed data on the drill. He dealt largely with the basic nature of the revolutionary type tool. It uses sound waves to impart a percussive action to the bit.

Bodine, however, did reveal several interesting sidelights on its performance during field tests made by Borg-Warner, sole licensee.

How it works . . . The sound-powered drill uses standard rotary equipment. Only change is insertion of a sound-generating package in the drill-collar string. All percussive motion is confined to the drill-collar system.

Bodine said the drill collar furnishes an ideal high-impedance acoustic circuit for carrying out sonic drilling. For generating sound waves in the collar, a group of unbalanced weights is employed. These are driven by a turbine which receives its energy from mud stream delivered down the drill pipe. This equipment is housed in a sub which is independent of the bit action.

By being able to connect the sound-wave generator to a region of the drill collar with relatively low impedance, advantage is taken of a so-called "inductive coupling."

"This means we can deliver the energy by use of properly phased centrifugal forces from this group of unbalanced rotor weights," Bodine said. "By use of this inductive-coupling procedure we accomplish a down-hole drill system in which actuation of the bit does not involve direct drive from the mud engine itself.

"From a practical standpoint this means the bit can be stalled without stalling the mud engine, and without increasing any stress loads in the mud engine. We have a motor-generator unit which runs quite freely at all times. There are no problems of cutting out turbine blades due to stalling, with resulting blade erosion."

Range of cutting . . . In describing the acoustic circuit set up in the drill collar Bodine explained:

"When we resonate the drill collar with a half-wavelength mode of vibration, center of the system stands still and the two ends alternately approach and leave each other. If we find the free end of the drill collar does not deliver a high enough impedance for the earthen formation, more weight is set against the bit. This tends to shift the center region down closer to the bit so that impedance in the region of the bit is even further augmented.

"We have not yet found any earthen formation whose impedance is so high that we have shifted the center of the drill collar down very far percentage-wise," he declared.

Performance highlights . . . Following his prepared address Bodine answered numerous questions from the floor. These revealed:

. . . Drilling rates with the sonic bit have consistently been greater for the same amount of horsepower input than those obtained with conventional rotary equipment. The drill string usually was slowly rotated during drilling, but this practice had no apparent effect on drilling rates.

. . . Bit design has not been a particularly critical factor. Most work has been done with a five-star type bit. While rotary bits have not performed well, Bodine said this was to be expected since the bearings and other parts were not designed for the loads involved. Sharp cutting edges probably are not necessary. In fact, better performance was gained from star bits which were slightly dulled.

. . . Drill-pipe fatigue will not be a problem because vibrations are confined to the drill-collar system and bit. There is so little vibration in the drill string it is difficult to determine at the surface when the sonic drill is in operation. Steels used in conventional drill collars are sufficiently strong to withstand stresses encountered in sonic drilling. Sound-wave patterns can be established so that maximum stresses are kept away from tool joints.

. . . Coring was successfully carried out in soft formations. One 8-ft. core was recovered using an open-ended drill collar. How well the sonic drill will core in hard, frangible rocks, such as chert, has not been determined.

Seismic Firms Close Deal

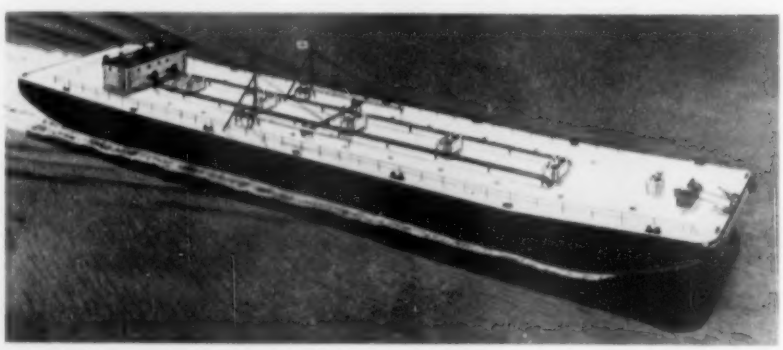
DALLAS.—Exploration Seismic, Inc., a wholly owned subsidiary of Exploration Surveys, Inc., Dallas, has bought all of the seismograph-contracting facilities of Midwestern Geophysical, Tulsa.

Don Jopling, president of Exploration Seismic, said the deal includes about $200,000 in equipment, including the most recently designed magnetic recording and high-resolution instruments.

Essentially all personnel now working for Midwestern Geophysical will be retained by Exploration Seismic.

M. E. Morrow, chairman of Midwestern Geophysical, said his company sold its seismograph-contracting division so it can concentrate on designing, manufacturing, and selling geophysical instruments. He said the parent company, Midwestern Instruments, Inc., which manufactures electronic instruments, also is expanding. The parent firm is building a $1-million laboratory in Tulsa as part of the expansion.

Exploration Seismic plans to employ the newly acquired facilities in operations in the Mid-Continent and in Cuba and Jamaica.



World's Largest Tow Barge Being Built

Artist's conception of world's largest oil-carrying tow barge being built for Tide Water Associated Oil Co. by Pacific Coast Engineering Co. of Alameda, Calif., is shown above. The vessel will have 14 separate cargo tanks with a capacity of 48,100 bbl. of oil. It will be 290 ft. long, 50 ft. wide, and have a draft of 18 ft. 10 in. It will be classed for coastwise trade.

Coke Plant Planned

Unusual gilsonite process also to turn out gasoline

SALT LAKE CITY.—The American Gilsonite Co. has announced plans to build a $10 million plant in western Colorado to process gilsonite, a solid bituminous material, into gasoline and coke. The company is owned jointly by Barber Oil Corp. and Standard Oil Co. of California.

American Gilsonite will move the gilsonite in a slurry form by pipeline from its Bonanza, Utah, mine to the new plant. Equipment to be installed there will consist of a delayed coker of modified conventional design, fractionating facilities and a catalytic reformer.

Fractionating facilities will handle liquid cracked products and the catalytic reformer will make a high-octane gasoline equivalent to aviation gasoline.

Principal product of the plant will be coke. It will be a high-grade, high-purity electrolytic coke suitable for manufacturing electrodes used in aluminum production and for making specialty carbon products.

Plant capacity will be 600 to 700 tons daily, the equivalent of about 2,000 bbl. daily in volume.

Texas Eastern Floats Loan

SHREVEPORT.—Texas Eastern Transmission Corp. has negotiated a revolving credit loan agreement with five New York banks for $56,000,000 to spend on two large expansions.

One project is the proposed conversion of most of the Little Big Inch line from natural gas to products. It runs from the Houston-Beaumont-Port Arthur area of the Gulf Coast to the East Coast. A new pipeline will be built to maintain the company's present delivery capacity for natural gas.

The second project would extend Texas Eastern's system to unrevealed new sources of gas supply and expand capacity of the existing system north and east of Beaumont.

DX-Sunray Plans Coker

TULSA.—DX-Sunray Oil Co. will build a 7,000-bbl. delayed coker at its 64,000-bbl. West Tulsa refinery. M. W. Kellogg Co. will be in charge of engineering and materials procurement. The unit will be erected by DX-Sunray's engineering department.

The coker will be completed in November. It will remove the company from the residual fuel oil market, since the company's refinery at Duncan, Okla., also has a delayed coker.

Imports Show Seasonal Decline

IMPORTS of crude and products into the continental United States in April were the lowest for any month since last November. The average for the month, however, still was 18 per cent above April 1954.

Total imports averaged 1,120,000 bbl. daily in April compared with 1,377,000 bbl. daily in March and with the all-time record of 1,405,000 bbl. daily in February.

The reduction of 257,000 bbl. daily from March was mostly seasonal. Product imports reach a peak during the winter months, because more residual fuel is brought in to meet higher demands through the heating season.

Product imports start falling off as soon as the heating season is over. Plans of importing companies, reported to the Texas Railroad Commission, indicate that product imports will reach the low point of the year in July.

April is a between-seasons month for refiners. Demand for heating oils is about over. The only extra gasoline demand is from early use in farming. Since refinery runs always drop off in April, less foreign crude was brought in by importing companies.

Crude imports for the month averaged 694,000 bbl. daily compared with the all-time record of 790,000 bbl. daily set in March.

Exports of crude and products averaged 308,000 bbl. daily in April, representing a gain of 30,000 bbl. daily over March. Most of the increase came from larger shipments of crude and residual fuel. Lube oil exports gained slightly to reach 40,000 bbl. daily for the first time since December. Gasoline gained only 1,000 bbl. daily after dropping in March to the lowest point in a year.

Import-export data in the tables are compiled by the Census Bureau of the Department of Commerce.

IMPORTS INTO CONTINENTAL U. S.

(Thousands of barrels)

Crude—	April 1955	March 1955	April 1954
Mexico	491	501	272
Colombia	735	829	1,150
Venezuela	10,918	14,597	10,368
Peru		125	
Kuwait	2,916	3,592	1,997
Saudi Arabia	2,682	2,697	2,410
Neutral Zone	165	219	220
Iraq	544	367	177
Qatar	236		213
Canada	904	929	109
Far East	1,227	624	749
Total crude	20,818	24,480	17,665
Daily average	694	790	589
Products—			
Residual fuel	11,734	16,037	9,745
Other products	1,055	2,168	1,056
Total products	12,789	18,205	10,801
Daily average	426	587	360
Total all oils	33,607	42,685	28,466
Daily average	1,120	1,377	949

EXPORTS*

	April 1955	March 1955	April 1954
Crude	1,431	771	1,418
Gasoline	1,621	1,644	1,870
Kerosine	216	178	583
Distillate fuel	1,217	1,515	1,874
Residual fuel	2,535	2,255	1,674
Lube oils	1,216	1,191	1,463
Other products	1,015	1,074	1,052
Total all oils	9,251	8,628	9,934
Daily average	308	278	331

*Excludes shipments to territories.

Industry Briefs

TULSA.—Directors of Deep Rock Oil Corp. propose to change the name to Cresent Corp. The proposal will be submitted to stockholders July 12. Deep Rock has disposed of its refining and marketing facilities during the past year through sales to Kerr-McGee Oil Industries, Inc., and General American Oil Co. of Texas. The company will continue its exploration and production program along with operating as an investment and consulting firm.

DALLAS, Tex.—Producing Properties, Inc., Dallas, last week paid Foundation Oil Co. of Tulsa $750,000 for Foundation's working interest in eight oil wells in the East Texas field. The wells are in the George Hampton and G. W. Hooper surveys in the Gregg County portion of the big field. Gross daily allowable of the wells is 160 bbl.

VELASCO, Tex.—Dow Chemical Co.'s new synthetic-glycerin plant is scheduled to begin production here late this summer. With a rated capacity of 36,000,000 lb. per year, the plant marks Dow's entry into glycerin manufacture. It is said to be the second synthetic-glycerin unit in the world producing on a commercial scale.

AUSTIN, Tex.—A unitization agreement covering 675 acres in Lopez field of Duval County, Texas, has been approved by the Texas Railroad Commission. Also approved are a water-flooding program and transfer of allowables of injection wells.

Kerr-McGee Opens Oil Industry's First Uranium Mill

The oil industry's first uranium mill (above) was officially dedicated last week. The $3,000,000 mill, near Shiprock, N. M., was built by Kerr-McGee Oil Industries, Inc., Oklahoma City, to process ore from the company's six uranium mines and those of other operators in a 150-mile radius. Dean McGee (at left in picture at right) Kerr-McGee president, and Sen. Robert S. Kerr, board chairman, are shown at one of Kermac's mines after the official dedication ceremony. Kerr-McGee first got into the uranium field in 1952 with the purchase of 4,000 acres of leases in northwest New Mexico, all on the 24,000-sq. mile Navajo reservation. The company now employs 100 at the mill and 50 at its mines, located about 50 miles away.

OCAW Looks Ahead, Predicts . . .

Most Powerful Union In Making

DENVER.—The C.I.O. Oil, Chemical and Atomic Workers International Union believes it is "destined" to be the most important and powerful labor union in North America.

The day will come when it will have such tremendous power it will "hold the economic welfare of the United States and Canada in its hands," according to an editorial in the current issue of Union News, O.C.A.W.'s official paper.

The editorial, in effect, tips off industry that merger of the oil and chemical workers some months ago was only the beginning of what the union hopes to achieve. The merger brought together in one union about 200,000 workers in the oil, chemical and atomic fields in the United States and Canada.

O. A. (Jack) Knight, president of O.C.A.W., makes no secret that he is shooting for a million-member organization embracing all such unions. He has the solid backing of C.I.O. President Walter Reuther.

"The industries within O.C.A.W. jurisdiction are the industries which produce the energy on which all other industries, business and commerce depend," the editorial states. "Already, oil and natural gas have replaced coal as the major source of power and energy. Within a few years, atomic energy will assume importance in producing electricity and other forms of power."

"Oil, chemical and atomic power are rapidly becoming the most vital elements of our economy," the editorial adds. "Should oil refining be stopped, the nation would be paralyzed within a few days. Should chemical manufacturing be stopped, dozens of other industries would fall like tenpins. In the near future, this may be true of atomic energy."

However, the editorial says the union also realizes it will have great responsibilities along with the power.

"The men and women who work in these industries, and the unions which they form, will have tremendous power and with it tremendous responsibility.

"It will have the strength to bargain hard and secure wages and working conditions far above the most rosy dreams of today."

The editorial pledges the power would not be abused.

GAW Unlikely in Oil Industry

DENVER.—The guaranteed annual wage, recently won by the United Auto Workers Union in contracts with Ford and General Motors, is not likely to spread to the oil industry.

GAW is a "rather academic" question for members of the C.I.O. Oil, Chemical and Atomic Workers Union, President O. A. (Jack) Knight said last week. "Seasonal operations in the oil industry pretty well balance out and employment is relatively stable," he explained.

O.C.A.W. contracts negotiated in the next few months, Knight said, will concentrate on obtaining further wage increases rather than winning unemployment pay.

Apco Plant Linked to Line

DUNCAN, Okla.—Anderson-Prichard Oil Corp. will connect its Cyril, Okla., refinery to the Great Lakes Pipe Line Co. system at Sunray Village. A 4-in. line previously used for crude oil service is being converted to handle

products. A 15-mile extension of the line to Sunray Village will be completed by September.

The line will be used principally for movement of distillates and some motor fuels. The 11,000-bbl. refinery at Cyril is a large manufacturer of special naphthas, solvents, and asphalts.

Tanker Strike Ends

Settlement halts threat of big refinery shutdown

NEW YORK.—Threat of a refinery shutdown on the East and Gulf coasts was averted late last week when major oil-tanker operators and the National Maritime Union agreed on a new contract.

N.M.U. members struck the tanker firms June 17 and early last week stationed pickets around big refineries on both coasts which receive crude supplies by water.

When refinery employes refused to cross the N.M.U. picket lines, The Texas Co. shut down its Eagle Point Works at Westville, N. J. Pickets also appeared at other refineries at Claymont, Del., Marcus Hook, and Philadelphia, Pa., and Port Arthur, Port Neches, Houston, and Texas City, Tex. But the dispute was settled and pickets withdrawn before these plants were forced to close.

The maritime union had no dispute with the refineries but was at loggerheads with owners of oil tankers over provisions of a new contract. The seamen demanded unemployment benefits for workers who quit jobs voluntarily.

Tanker owners said they had agreed to all other union demands but at first balked at benefits for "voluntary quits." They claimed this would put a premium on quitting and discriminate against N.M.U. members who continue working. They also contended such an arrangement would discourage rather than promote stability of employment.

Dry cargo and passenger ship owners accepted the N.M.U. demands on this point but tanker owners refused until late last week. Sinclair Refining Co. was the first major oil firm with a tanker fleet to come around to the union demand. Others quickly followed. Exceptions were a few small companies whose ships were at sea. They were expected to sign before their ships docked.

Major oil companies represented in the tanker firms being struck included The Texas Co., Gulf, Sinclair, Amoco, and California Standard. Other tanker companies included American Trading & Production Corp., Circle Shipping Co., National Bulk Carriers, Inc., and Sword Lines, Inc.

Educational programs pay off . . .

. . . Drillers Get More Training

DALLAS.—The men who run the industry's drilling rigs are becoming better trained.

This added training is the result of educational programs sponsored by the American Association of Oilwell Drilling Contractors, the American Petroleum Institute, and by several energetic petroleum educators. The educational programs include training courses, films, and books.

The A.A.O.D.C. has been presenting practical courses on just about every mechanical phase of drilling operations, geology, mud practices, and supervisory training. This program is being directed by the association's research and education committee, which is headed by John B. Holmes, Holmes Drilling Co., Houston. The committee reported on its activities at a recent A.A.O.D.C. directors meeting in Denver.

Here's what the president of one of the largest rotary drilling contracting firms says about the program:

"We are rather proud of what is being accomplished in the way of educational programs, not only for our own personnel, but in many cases the personnel of the oil-producing companies. . . . The present committee is continuing the good work which has been carried on over the past several years."

The A.A.O.D.C. committee has sponsored two schools of drilling technology at an Odessa, Tex., college. Fifty instructors participated in the courses. Enrollment totaled 114 and included drillers from Texas, California, Louisiana, Oklahoma, Wyoming, West Virginia, New Jersey, Venezuela, Germany, Holland, and Chile. A third course is planned this fall.

The association plans to expand its instructions into other states. An outline of material used is being prepared so that a drilling school can be conducted whenever space and instructors are available.

The A.P.I. is sponsoring a similar school on production practices at Kilgore, Tex.

Texas University's role . . . Prominent in organizing the drilling and production educational program is Prof. John Woodruff's Petroleum Extension Service (Petex) at the University of Texas.

Seven courses have been held during the past year, four in Louisiana and three in Texas. Enrollment at these courses total 183. During the past 9 years, more than 8,000 have attended the sessions.

One of the most popular courses offerred by A.A.O.D.C. and Petex is a course on "Handling and Running of Casing." During the past year, this course was attended by 215 men in six different states. Since 1952, 5,642 have taken the course.

Films . . . The A.A.O.D.C. committee and several well-service companies are sponsoring a series of seven films on well completions. These cover cementing tools and equipment, cementing operations, electric logging, radioactivity logging, perforating, hydraulic fracturing, and acidizing. The hydraulic fracturing and acidizing films were made by the University of Oklahoma and the other five by Petex.

Books . . . Response to two primers A.A.O.D.C. and Petex have published has been exceptional. Over 20,000 copies of the "Primer of Well Service and Workover" have been printed since October 1954, and 17,000 copies sold. The "Primer of Oil Well Drilling" continues to sell about 850 copies a month. There have been 41,000 copies printed.

The A.P.I. committee on drilling-fluid study has revised its manual "Principles of Drilling Mud Control." This book is the textbook used in mud schools. Since mud schools were started in 1946, 20,000 copies have been sold.

ATTENDANCE AT PETEX TRAINING COURSES—LAST 12 MONTHS

Subject—	No. field locations	No. company sponsors	No. enrolled
Handling and Running Casing	12	14	295
Principles of Drilling-Mud Control	3	6	84
Handling the Drill Stem	3	1	52
School of Drilling Technology			114
Field Handling of Natural Gas	55	23	1,653
Care and Handling of Sucker-Rod Pumps	21	14	477
Care and Operation of Pumping Engines	4	1	70
Gasoline-Plant Instruments	3	1	143
Basic Electricity	3	1	143
Care and Operation of Pumps	3	1	143
Group Instruction Techniques	3	1	42
Treating Oil-Field Emulsions	5	1	83
Total			3,299

GULF COAST

Offshore Line Ready

48-mile submarine line to carry both oil, gas

MORGAN CITY, La.—The world's longest submarine pipeline is expected to be completed and placed in operation by July 1.

The line, being laid by Brown & Root, Inc., Houston, follows a 48-mile dogleg route from Burns Terminal to the most distant production yet found on the Continental Shelf.

The 12-in. carrier is owned jointly by Magnolia Petroleum Co., Continental Oil Co., and Newmont Oil Co. It will tap oil production 25 miles offshore in Block 126 field. It also will pick up oil and gas production from Blocks 45-51 in the Eugene Island area closer to shore.

Along with being the longest undersea line in the world, the line is unusual in that it will carry both oil and gas.

Oil and gas, and even oil, gas, and distillate, have been commingled before in pipelines but never in so large a line and in a carrier connecting several fields.

A central separator platform has been erected in each field. Fluid will be separated and measured at these platforms, then commingled and returned to the line. Final separation and dehydration will be handled at Burns Terminal. What small amount of water is produced with the oil will be removed at the well by free-water knockouts.

Gas from Burns Terminal will go to a transmission company, the oil to refining centers on the Gulf Coast.

The line will have a crude capacity of about 50,000 bbl. daily. The three companies have been producing about 5,000 bbl. a day from leases off Burns Terminal. They could have produced much more than this except that barging operations were suspended frequently due to foul weather.

The pipeline is of electric-welded steel pipe, with a double coal-tar-enamel wrap and a 1½-in. coating of reinforced concrete.

Commonwealth Oil Expands

HOUSTON. — Commonwealth Oil Co. of Miami will acquire Marine Gathering Co. of Houston as a wholly owned subsidiary under a proposed $8 million transaction announced here. Commonwealth stockholders still must approve the plan.

Under the plan Commonwealth would exchange 2,750,000 shares of its common stock and a large block of new preferred stock for 100 per cent of Marine's stock. John H. Blaffer and G. Burton Liese, Houston, and Philip C. Dixon, New York, hold all the Marine stock.

Commonwealth holds oil and mineral leases on more than a million and a quarter acres in Florida. It also owns an exclusive exploratory concession covering the entire Republic of Haiti.

Marine Gathering built and now operates the first underwater pipeline system to transport natural gas from wells in the Gulf of Mexico. It also owns and operates a gas processing plant in Cameron Parish, Louisiana, and owns part interest in a Duval County, Texas, processing plant. In addition it holds 50 per cent interest in Dela Oil Co. of Houston.

Rocky Mountain

Montana Crude Line Started

BILLINGS, Mont.—A 78-mile, 6-in. crude-oil pipeline is being laid between Sumatra pool of central Montana and the Billings-Laurel refining area by Art Hartwig, Inc., of Billings. The project will cost about $1 million.

The pool's daily production of about 4,600 bbl. now is being trucked. The oil is produced by The Texas Co., Gulf Oil Corp., McAlester Fuel Co., and Continental Oil Co.

The crude will be purchased by Carter Oil Co. and Farmers Union Oil Co.

Dispute Snags Pipeline

DURANGO, Colo.—A dispute over offers for farm rights-of-way may delay construction of a 20-mile section of the Pacific Northwest Pipeline Co.'s 26-in. natural-gas line from the San Juan basin in Colorado to Sumas, Wash.

Work was scheduled to begin July 1 on the Ignacio, Colo., to Moab, Utah, portion of the 1,466-mile line. But R. C. McCampbell, right-of-way supervisor for Fish Northwest Constructors, Inc., which is building the $153 million line, said he doesn't know when the project will get under way.

He said only six landowners had been offered contracts before the controversy embroiled some 40 farmers and ranchers. The others will be contacted individually as soon as possible.

New Leasing Rules Planned

HELENA, Mont.—New restrictions are being written into oil and gas leases issued by the Montana Land Board.

Beginning in July, the board may—at its discretion—cancel a lease if the holder fails to drill and make a reasonable test for oil and gas within the first 2 years.

The industry is questioning whether the board has authority to terminate leases anytime in the first 6 years under terms of a 1955 legislative act.

Refining Briefs

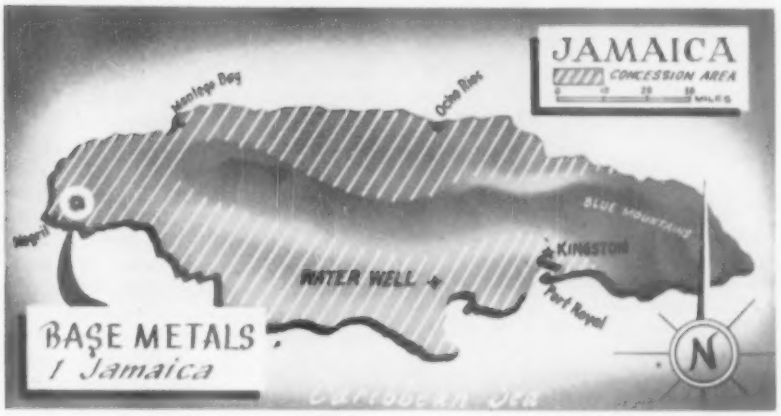
PHILADELPHIA.—Sun Oil Co. is making a new, higher octane gasoline which it still will market under a single grade. The company announced the higher grade gasoline after completing two 28,000-bbl. Houdriflow units at its Marcus Hook and Toledo refineries. An 18,000-bbl. Houdriformer also will be completed at Marcus Hook this month. The announcement was made through a closed-circuit television program witnessed by 14,000 Sun dealers and distributors over 30 different stations. Sun has spent $25 million in the past 15 months for products improvement facilities.

CORPUS CHRISTI, Tex. — North American Petroleum Corp. will build a 2,000-bbl. daily catalytic reforming unit here to turn out premium-grade gasoline under a license agreement with Atlantic Refining Co. Construction is to begin immediately with completion late this year. North American is a new firm headed by Victor Vermilyea.

CASPER, Wyo.—The Texas Co. has contracted with Fluor Corp., Ltd., to design, engineer, and build a 4,800-bbl. per day Unifiner-Platformer unit at the Texaco refinery here. The new unit will be on stream early in 1956. It will process heavy straightrun and cracked naphthas.

NEW YORK.—M. W. Kellogg Co. will move its head offices from 225 Broadway to a mid-Manhattan location at 711 Third Avenue. The move is scheduled for next February when the new 19-story Grand Central Building is completed. Kellogg will occupy seven floors.

CHICAGO.—Pure Oil Co. soon will announce contracting for a large catalytic reforming unit at its Smiths Bluff, Tex., refinery. Construction is due to start within 3 months. Another unit of the same type and size will be added later to the Lemont, Ill., refinery. Pure now has one catalytic reformer, a 3,000-bbl. per day unit at the Heath refinery, Newark, Ohio. This unit uses the Sinclair-Baker platinum catalyst and incorporates hydrogen treating of the naphtha charge stock.



Jamaican Shows Logged

Base Metals maps energetic drilling program following favorable reports from test near western tip of island

Robert J. Enright

THE first wildcat ever drilled in Jamaica, B.W.I., reached total depth early this month after logging several promising shows of oil and gas.

The test was drilled to 6,300 ft. near Negril in Westmoreland County on the western tip of the island by Base Metals Mining Corp., a Toronto, Canada, firm.

Base Metals is headed by Franklin D. Roosevelt, Jr., as chairman of the board, and C. D. Cameron, of Toronto, as president. It holds an exploration concession granted by the governor of the British colony. The concession covers roughly 5,000,000 acres of the island and surrounding tidelands.

The Jamaican wildcat, Base Metals technicians say, has exploded the long-accepted belief that the island was blanketed almost entirely with Eocene-Cretaceous volcanic rocks and that the possibility of establishing oil production was practically nil.

The Base Metals 1 Jamaica, according to Jack Colle, Houston consulting micropaleontologist, was still in Eocene sediments at 5,800 ft. and at total depth was in green, sandy shale possibly of Upper Cretaceous age.

Location for the 1 Jamaica, an obligation well, was spotted via aerial photographs on a faulted anticline about 10 miles long and trending from northwest to southeast. Drilling proved the well to be definitely off structure with formations dipping from 10° to 30°.

A complete Schlumberger Well Surveying Corp. unit was maintained at the well site during the drilling operation. The unit ran electric, micro, and gamma-ray logs, along with pulling some sidewall cores.

The test picked up a strong gas show at 760 ft., residual oil and salt water shows at 2,700 ft., 3,204 ft., 3,370 ft., and from 3,755-73 ft.

Dr. R. G. Hamilton, Tulsa consulting geophysicist, said the entire section from 2,700 to 3,450 ft. had sufficient porosity to afford a good reservoir. He said the shows of residual oil indicate a more favorable location on the structure probably would develop commercial production.

Drill-stem testing of the shows has been stymied by bentonitic, heaving shales which several times stuck the drill pipe. Lost-circulation in the porous formations also plagued the operator, especially during the top 800 ft. Steeply dipping sediments made it difficult to keep the hole straight.

The sedimentary section penetrated by the wildcat, Hamilton said, was predominantly limestone, with frequent sand and shale breaks. Porosities of the limestones ranged up to 30 per cent.

Hamilton said the Jamaican limestones are more like those of Venezuela than of Cuba, where pyroclastics and volcanic ash are common, or Haiti, where the geology is almost exclusively dolomitic lime.

Seismic crew dispatched . . . Base Metals expects to spud in its second well about mid-July. It will be located higher on the structure, probably some distance southeast of the 1 Jamaica. A detailed coring and testing program is planned for this second test.

Early last week, a seismic crew of Exploration Seismic, Inc., a wholly owned subsidiary of Exploration Surveys, Inc., of Dallas, arrived at Jamaica from Corpus Christi.

Don Jopling, president of both these firms and technical advisor to Base Metals, said the crew already has started detailing the structure in the Negril area and will be spotting the second and other locations soon.

More exploration planned . . . Base Metal's agreement requires the company to drill 8 wells a year for the next 2 years, or 16 in all.

Additional surface work over the entire concession will be carried out by the organization of Dr. J. C. Sproule, Calgary consulting geologist. This work will lay the base for the seismic program to follow.

Exploration Seismic will have three crews on the island by the end of the year. One of these will concentrate on the tidelands portion of the concession.

Along with the additional drilling on the Negril structure, Base Metals plans two deep tests, probably to about 10,000 ft., in the area west of Kingston, the island capital.

Reynolds Metals Corp., which is mining bauxite in Jamaica, drilled a water well in this region about 25 miles west of Kingston in which a strong show of oil was developed. The well, which went to 2,000 ft., was on the flank of the structure, Jopling said. Cores from this well are available for Base Metals use.

So far the only rig in the country is the National 50 rotary operated by E. L. Oliver Drilling Co., Oklahoma City, which drilled the 1 Jamaica. The well was spudded late in March and reached total depth June 5.

Base Metals needs more drilling equipment to fulfill its pressing drilling obligations and is negotiating now to bring more rigs into the country. One will have to have a capacity in excess of 10,000 ft. to drill the deep Kingston area tests.

The concession . . . Jamaica is roughly 180 miles long from east to west and about 50 miles wide at its widest from north to south. A chain of mountains splits the island from the eastern end, sloping off to foothills in the vicinity of Montego Bay on the northwest coast.

The eastern quarter of the island is largely volcanics. A relatively flat, somewhat swampy plain flanks the mountain range through the rest of the country.

Base Metals' inland concession takes in all of the nonmountainous area on both north and south coasts. The tide-

lands concession takes in the entire shelf region and includes the Cayman Islands area off the west tip of Jamaica.

The company negotiated its exploratory concession—which also is for bauxite, bentonite, and other minerals—early in 1953 after preliminary surface mapping by the Sproule organization in 1952.

This work established a series of prominent surface structures extending almost all the way along the southwest coast. The company also has had the benefit of structure mapping done in 1952 by Dr. V. A. Zans, geologist for the Jamaican Government. Zans has worked closely with Base Metals personnel since the concession was granted.

Base Metals officials term the agreement one of the most favorable yet negotiated. Taxes are almost negligible, and the company says it has experienced no difficulty from an exploration standpoint in working in a sterling area.

The Jamaican oil law is modeled after that in Canada. If production is found, acreage will be checker-boarded. The company making the discovery will retain leases on every other block, and the remaining tracts will be leased after competitive bidding. The discoverer will have the option of meeting the highest bids for leases on these latter tracts.

Equipment and supplies for the Base Metals venture are being landed at Ocho Rios on the north coast where Reynolds Metals' dock facilities have been made available. Base camp for the drilling and seismic crews and the Schlumberger unit is at Montego Bay.

The company is using a big percentage of Jamaican labor, including roughnecks. The company says the natives are good workmen—strong and apt and exceedingly cheap. Jamaican laborers consider 75 cents a day or its equivalent a very high wage.

Venezuelan Test Hits

Sinclair subsidiary extends Greater Oficina fields with two-zone producer; well is third strike within 3 years

THE Venezuelan Petroleum Co., a subsidiary of Sinclair Oil Corp., has discovered oil in a new area in the State of Monagas.

The discovery well, No. 1 Aguasay, is about 2¼ miles northeast of the nearest production, which is in the Greater Oficina area across the border in the State of Anzoategui. The discovery is an extension of the Greater Oficina fields and is probably a new pool. The well is about 35 miles southwest of Venezuelan Petroleum's Santa Barbara field.

Production was found at two horizons, 12,495 to 12,500 ft., and 11,994 ft. to 12,032 ft. On 5-hour initial tests, the well flowed 27.1°-gravity oil at rates ranging from 720 to 1,019 bbl. daily from the lower formation and at 803 bbl. daily from the upper formation. Tests were through a ¼-in. choke. The well will be completed in both zones.

Production came from the Oligocene sands, the same sands which produce in other Greater Oficina areas.

The deep test found oil sands at greater depths than other nearby production. This was attributed to the location of the well deeper in the Maturin basin. The pay section is 500 to 1,000 ft. deeper at the Aguasay No. 1 than it is 2 to 3 miles to the west or south.

Venezuelan Petroleum, 96 per cent owned by Sinclair, has a sizable block of concessions north of the well.

Other discoveries . . . The Aguasay No. 1 is the third promising discovery made by Venezuelan Petroleum in as many years.

In May 1953 the company discovered oil in its concession in the State of Barinas with its Sinco No. 1. Since then, four wells have been completed on the concession. Reserves in Barinas are estimated at 66 million barrels. Ultimate recovery is expected to be doubled if pressure can be economically maintained. The company is considering laying a pipeline from the Barinas wells to the Caribbean coast *(The Oil and Gas Journal, April 18, page 115)*.

In February 1954, the Santa Barbara extension was discovered. Ten wells were completed by the end of the year and production, including natural gasoline, reached an average of about 4,800 bbl. daily.

Tanker Ends Trip

Maiden Atlantic crossing made by largest oil ship

THE world's largest tanker, carrying 278,000 bbl. of crude from Ras Tanura, has completed its maiden voyage from the Persian Gulf to the United States East Coast.

The Al-Malik Saud Al-Awal, flying the Saudi Arabian flag, tied up at Socony Mobil Oil Co.'s dock at Paulsboro, N. J. It was chartered by Socony Mobil, a parent company of Arabian American Oil Co. in substitution for two smaller ships retained previously.

The huge tanker was part of a fleet owned by A. S. Onassis, Greek shipowner whose agreement with Saudi Arabia for preferential shipping rights is under arbitration in Geneva. It was sold this spring to Saudi Arabia.

The shipping agreement, not yet in effect, would permit Onassis to set up a Saudi-flag fleet of at least 500,000 tons in return for virtual control of that country's crude shipments.

This deal, made early last year, was denounced by maritime nations, including the United States and Britain. Aramco invoked the arbitration clause in its concession contract for the first time in the company-government relationship.

The issue is whether Aramco's concession includes the right to transport Saudi Arabian oil. An adverse decision, it is believed, might result in similar exclusive agreements in other countries.

Arbitration began this month before a three-man panel composed of a representative from Aramco, one from the government and an umpire, Dr. Georges Sauser-Hall, Swiss legal expert and professor of international law.

Union Plans New Jungle Test

Cia. Petrolera, S.A., the Costa Rican subsidiary of Union Oil Co. of California, plans to spud in a third wildcat well in southern Costa Rica in mid-July. Two previous test wells drilled this year have been abandoned.

The third attempt will test an entirely different structure, described as an elongated dome that has some fault complications.

Union Oil's exploration contract with the Costa Rican Government calls for drilling a minimum of three wells. Operations are in the general area of Puerto Viejo, a village on the Caribbean coast of Costa Rica near the Panama border. Location is in dense jungle country through which engineers have been constructing an access road.

Refinery Started

Cairo plant will process Egyptian, Arabian crudes

A NEW refinery under construction at Cairo, Egypt, will start paying its way with completion of the first unit.

The government-owned plant is being built in conjunction with a 12-in., 93-mile pipeline from Suez to Cairo. Both the refinery and pipeline will have a capacity of 43,000 bbl. daily.

Egypt's premier, Col. Gamel Abdel Nasser, has laid the cornerstone for the $8,500,000 distillation unit, which will be placed in service immediately upon completion. Other units will be added gradually.

The distillation unit will be charged with topped Arabian and Egyptian crudes transported from Suez. It will take two distillate cuts, a diesel fuel, and a gas oil called solar oil. These are in demand in the Nile Valley.

Bottoms from the new unit will be heavy industrial fuel oil which will be used in the Cairo power plant. Eventually, pipeline and refinery throughput will consist of light crude oils produced domestically.

The distillation unit and pipeline are being constructed by Dalmine-Snam of Milan, Italy.

McCarthy Sells

New York group takes half interest in Bolivian deal

GLENN McCARTHY, Houston wildcatter, has sold a 50 per cent operating interest in his 970,000-acre Bolivian oil concession to a syndicate headed by a New York City import-export firm.

The syndicate, formed by Keljikan Commercial Corp., will put up $4,160,000 during the next 17 months to develop the concession.

John Keljikan, a partner in the export-import firm, says the development program will include 30 to 45 more wells and a 15-mile feeder pipeline to link the concession with the 6-in. crude line from Camiri field to Yacuiba on the Argentine border.

Pipe for the feeder line was shipped from Houston 2 weeks ago, Keljikan said.

McCarthy has two oil wells and one gasser on the concession. All three wells are shut in. A fourth is drilling.

The Keljikan syndicate will include V. B. Witherell, president of Sure Oil Co., Denver. Identity of the others involved has not been disclosed. Keljikan Commercial Corp. and Witherell's company are jointly interested in Kiespert Witherell, Inc., a drilling venture in the Rocky Mountain area.

Keljikan said last week the first oil from the concession will be moved by pipeline and sold just as soon as the feeder line is completed. McCarthy has a contract to sell up to 10,000 bbl. daily to the Bolivian Government for export to Argentina.

Pechiney to Expand

New process will be used to make perchloroethylene

PECHINEY, one of France's principal chemical manufacturers, will build a plant at St. Auban employing a new process for making perchloroethylene, fast becoming popular in making dry cleaning and degreasing agents.

Scientific Design Co., Inc., New York, will do the design and engineering work on the plant, the first in France to employ a direct chlorination process to manufacture the new product.

The plant will employ direct chlorination of ethane, methane, or propane. American plants producing perchloroethylene include Columbia Southern Chemicals Corp., which makes it from propane at Barberton, Ohio, and Diamond Alkali Co., which makes it from ethylene at its Pasadena, Tex., plant.

Fundamental features of the Pechiney plant will be based on a study of a pilot plant of Montecatini, Italy's chemical giant.

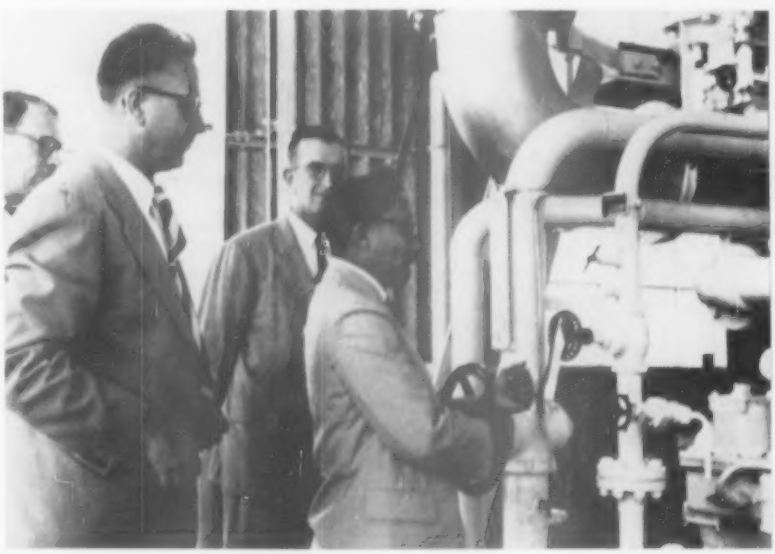
Chief differences will be a larger scale production and higher purity of byproduct HCl, which will be used in vinyl chloride production.

International Briefs

International Egyptian Oil Co. was drilling ahead last week in the lower Miocene below 8,100 ft. after testing six separate oil zones in the upper Miocene formations at its Belayim 2 well. Seven-inch casing was set at 7,858 ft. at the company's Belayim 3 after coring about 66 ft. of solid oil sand in the sixth zone. The Belayim 4 cored the uppermost oil zone from 5,135 to 5,191 ft. and was coring ahead.

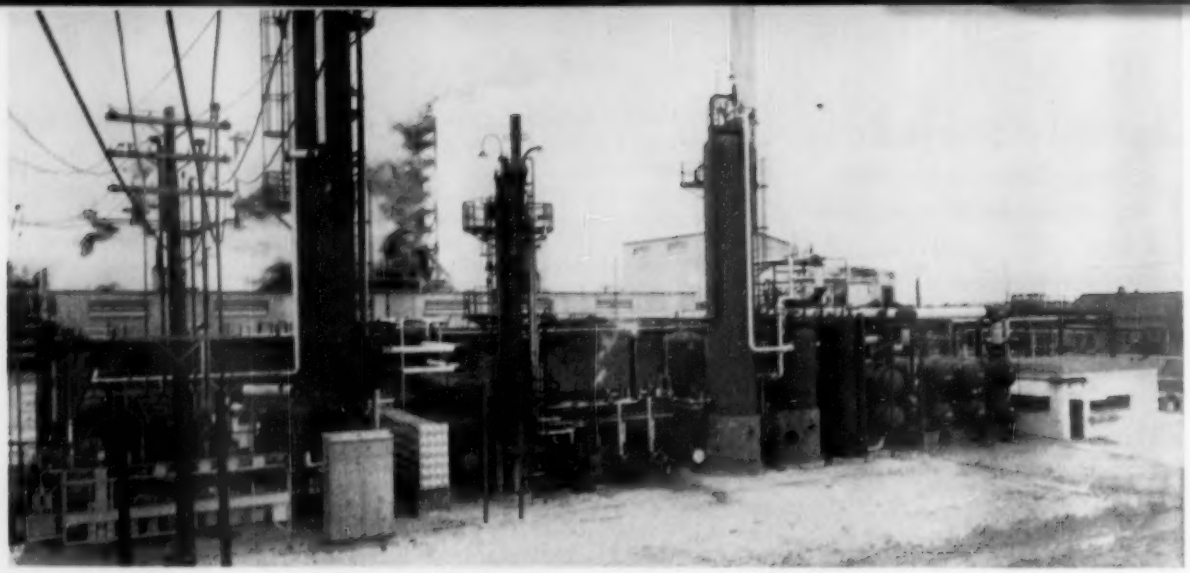
The keel has been laid for a 280,000-bbl. capacity supertanker, the seventh in the Dutch fleet of California Texas Oil Co., Ltd., in Schiedam, Holland. The vessel, to be launched early next year, will carry crude oil to the 20,000-bbl. daily Caltex refinery at Pernis, Holland.

Mene Grande Oil Co. of Venezuela has awarded contract to Levingston Shipbuilding Co. of Orange, Tex., for a 140-ft. drilling barge designed by Friede & Goldman, Inc., New Orleans. The barge is self elevating by means of hydraulically operated spuds. It will be used to drill in the open waters of Lake Maracaibo.



North Borneo Plant Opened

The Sultan of Brunei starts a 900-hp. compressor at the official opening of the new natural-gas processing plant in Seria oil field of North Borneo (The Oil and Gas Journal, March 21, page 137). Left to right are R. E. Hales, managing director of British Malayan Petroleum Co., Ltd. (Royal Dutch-Shell); A. E. O. Bennet, senior gas-plant supervisor; and the Sultan.



ATLANTIC'S electronically controlled Catformer unit at Atreco, Tex., includes fractionation section (foreground) and control house (lower right).

Here's the first report of Atlantic Refining's experience with . . .

Electronic Control of a Catformer Unit

AN 8,000-bbl. per day Catformer featuring an electronic control system has been operated by Atlantic Refining Co. since August 1954 at its Atreco, Tex., refinery.

What is this electronic system like? What are its advantages? What is the operating and maintenance experience to date? Have the objectives been met? From the experience gained, what changes will be made in future installations?

- The objectives certainly were met. Atlantic's first all-electronic installation has been more than satisfactory. Start-up was made without any delays due to instrument failures. Aniticipated "bugs" did not materialize. Subsequent operation has been continuous and dependable. Difficulties have been few and minor.
- It is too early to draw conclusions regarding maintenance. But it is clear that the electronic instruments can be maintained easily, without disruption of plant operation.
- The Catformer installation is operating with two men per shift. Improvement in control action has been realized. Savings in first cost have not materialized to the extent originally estimated. This is largely due to expenditures on an emergency power system which experience has shown were unnecessary.
- Some improvements will be made in future installations: (1) Such an elaborate emergency power system will not be installed; (2) field transmitters will have indications near the control valves; (3) electric or hydraulic control valves, if suitable ones are available, will be used where speed of response is significant; (4) further simplification and economies in interconnected wiring will be adopted; (5) absence of winterizing problems in cold climates will be exploited; and (6) initial stocks of spare instruments and parts will be reduced.
- This plant has shown that electronic process control is here to stay. There seems little doubt that the future trend is going to be strongly in this direction.

"This plant has shown that electronic process control is here to stay. There seems little doubt that the future trend is going to be strongly in this direction."

by F. C. Somers and R. C. Fuhs

Authors are with engineering and construction department, Atlantic Refining Co.

Why Electronic Controls?

A first-class, thoroughly modern installation should satisfy these requirements:

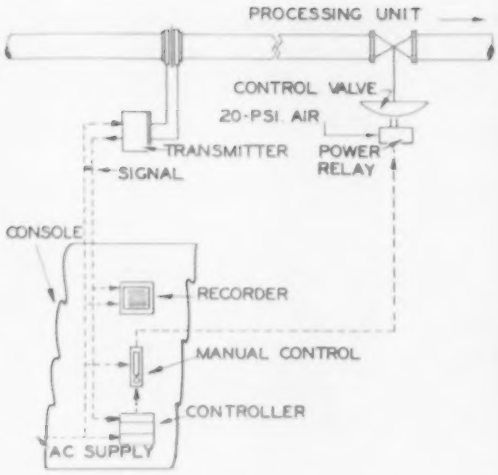
1. Operate dependably and accurately.
2. Offer low first cost.
3. Require minimum-size control house.
4. Require minimum operating personnel. Some instrument panels cover so much space that they require the attention of several operators.
5. Require less maintenance and be easier to maintain when maintenance is required.
6. Be adaptable to incorporating probable future developments in the field of automation.

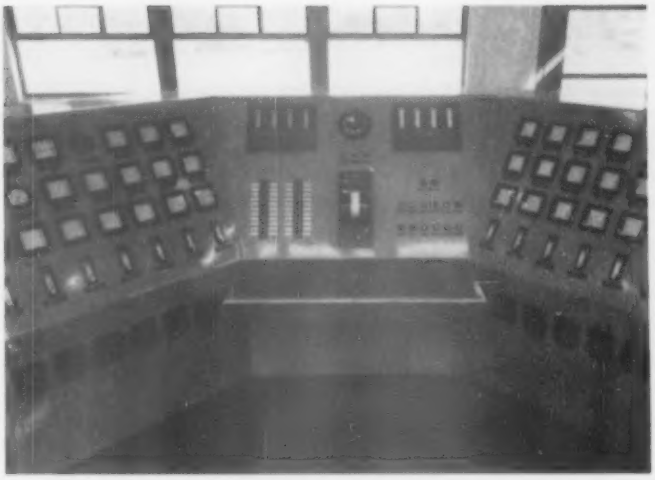
Careful evaluation by Atlantic engineers led them to choose an electronic instrument system. In conjunction with H. K. Ferguson Co. as contractors they went ahead with an electronic control system for the Atreco Catformer.

Operating experience was practically nonexistent at the time. But the marked reduction in moving parts and the inherent accuracy and absence of time lag in electrical measurements led to the conclusion that operation of an electronic system was potentially more dependable, as well as more accurate.

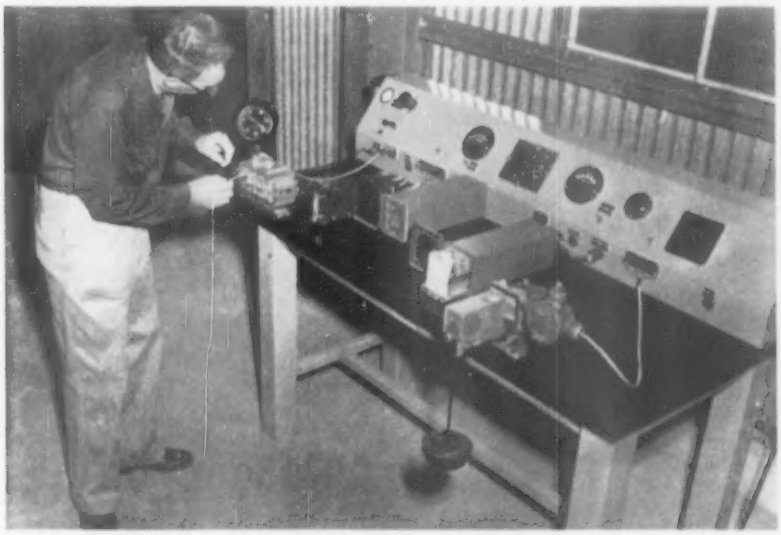
Costs . . . Economic studies indicated the installed cost of the electronic system was about 12 per cent less than for an equivalent pneumatic system. Equipment costs were not significantly different. Differences in installation costs, and particularly the differences in the cost of electric wiring versus pneumatic tubing, accounted for much of the saving. Investigation showed that electronic instruments in a console arrangement would result in minimum size control house.

Console . . . Employing electronic instruments in a console produces an extremely compact arrangement with all instruments and controls readily visible and accessible to a single operator. As

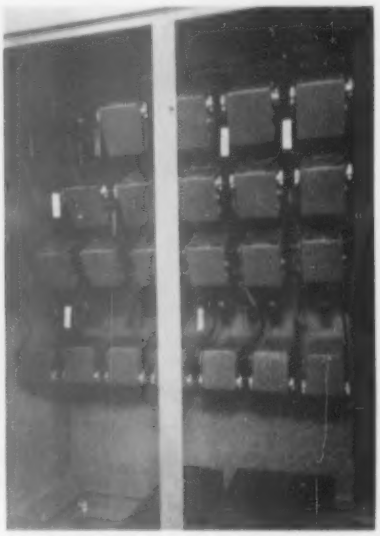




THIS DIAGRAM shows the flow-control system used at Atreco. The controls are grouped on the left side of the above console. Fig. 1.



THE COST of this test bench, $250, is easily justified because it performs system calibration and is used for instruction. Fig. 2.



ELECTRIC WIRING lends itself more readily to console connections than pneumatic types.

can be seen from Fig. 1, the console is not much larger than a conventional desk. Such compactness and accessibility are most desirable when operating the plant with a minimum number of shift operators.

Less maintenance . . . The fact that electronic instrument equipment has few moving parts, none of which is delicate, points in the direction of less maintenance. The "plug-in" feature of electronic instruments and controllers, in conjunction with the fact that control action can be preset to desired values without cut-and-try adjustments after installation, makes interchanging units a simple matter. Thus most maintenance work can be performed under favorable shop conditions.

Virtually all foreseeable future advancements, such as automatic data-gathering systems, are based on converting the measured quantities to electrical units and from this standpoint the electronic equipment is particularly advantageous.

The electronic system employed is the Swartwout Autronic Control system.

Basic principle . . . A measured variable is converted to a 0 to 0.5-volt, 60 cycle, a.c. signal in the primary element or transmitter which is mounted near the measuring point. This signal voltage is transmitted to the recorder or indicator in the recording systems, or to the recorder and controller in the control systems.

The controller converts the difference between the transmitter signal and the set-point signal to a d.c. current. This current is transmitted through the manual-automatic selector switch, called the manual control, to the electric to pneumatic transducer, called the power relay. The air from the power relay actuates any standard diaphragm valve. The recorders, controllers, and manual controls are located in the central control house, while the power relay is mounted near its control valve. A block diagram of a control system is shown in Fig. 1.

Mechanical design . . . This is the most fundamental consideration of all for peak performance, stable operation, and reasonable maintenance. It is believed that the equipment used is outstanding in this respect. Fig. 2 shows a transmitter and a power relay. Both devices are mounted in substantial cast

enclosures approved for use in Class I, Group D, Division 1 location. Attention is directed to the small number of parts and the rugged construction throughout.

Plug-in type . . . Both recorder and controller are flush-mounted, miniature, plug-in type, designed to require minimum panel space. A recorder or controller consists of a mounting frame which is permanently fastened to the panel with the recorder or controller proper being assembled as a removable chassis which plugs into the mounting frame. All external connections are made to a terminal strip at the rear of the mounting frames. Connections from the mounting frame to the removable chassis are made through a plug-and-socket arrangement very much like the plug and socket of the familiar radio tube.

This construction permits the controller and recorder to be easily removed from its mounting frame without disturbing any external connections.

The absence of delicate moving parts in both the recorder and controller is in contrast to constructions commonly encountered in other types of instruments. The manual-control unit is in its own enclosure and may be removed for repairs and replaced without disturbing the controller.

Installation

In the Catformer area a 12-ft.-wide accessway running the length of the plant is located between the fractionating section and compressor house. (See general photo of Catformer unit.) The plot is approximately 200 ft. long by 120 ft. wide. The instruments and controllers are centralized in the control house. An overhead metal cableway extending from the control house down the length of the accessway between the compressor house and the fractionation section carries the interconnecting wiring.

List of instruments . . . The instrumentation includes:

1. Twenty recording systems. (Electronic transmitters and recorders.)
2. Fourteen controlling systems. (Electronic transmitters, recorders, and controllers.)
3. Forty thermocouple points. (Read on an electronic-type indicating potentiometer.)
4. Four liquid-level indicators and controllers. (Pneumatic type.)
5. Two liquid-level controllers. (Pnematic controllers — locally mounted.)
6. Two high-level alarms. (Triggered by float-actuated switches.)
7. A cooling-tower low-water level and gas alarm.

"It is estimated that rate times in this installation are 50 per cent faster than for a pneumatic system. This makes it possible to hold the controlled variable within a closer tolerance to the set point."

8. Speed controllers on the four (Pneumatic controllers — locally mounted.)

Operation of all compressors and pump drives is monitored by running lights. With respect to Items 4 and 5, pneumatic liquid-level controllers were selected because a suitable electronic instrument was not available. Two of these level controllers are "blind" controllers, while four have the level indicated on the console. These four levels are the only signals pneumatically transmitted to the control house. Pneumatic speed controllers were chosen because they are completely locally mounted instruments and electrical transmission and control was not considered necessary.

Control House and Console

All instrumentation, with the exception of the compressor speed controllers, is mounted in a console-type panel located in the control house (Fig. 1). The panel instruments are the miniature, plug-in type and lend themselves to console arrangement.

The higher first cost of graphic panels, excess building space requirements, and general lack of convenience in operation as compared to a console are disadvantages that continue for life of the plant. A console has the advantages that all controls are visible to the operator at a glance, and it can be fabricated, tested, and shipped as a complete unit. This latter feature greatly eases the installation problems, since only a comparatively simple field recheck is necessary.

The cost of the control house is a large part of the total instrumentation investment. As an example of the economies that are possible by a combination of miniature instruments in a console arrangement, the control house for this plant is only 14 by 25 ft. inside. The area of this house is only 350 sq. ft. as compared to 900 sq. ft. required for another recently constructed Catformer using standard-size pneumatic instruments.

Normal Instrument Power System

The console presents a load on the 115-volt system of approximately 1,500 va. (volt-ampere). This power is fed by one circuit, but in the console it is subdivided into two main groups:

1. The instruments, which are fed through a 2,000-va. constant-voltage transformer.
2. Accessory equipment (clock, running lights, etc.), which is fed directly from the line.

The constant-voltage transformer serves as an isolating transformer, since the instruments have one side of their power circuit grounded and are being fed from a 115-volt ungrounded system. The instruments are the null-balance type and are not affected by nominal voltage variations; hence the constant-voltage feature is not absolutely essential.

The power-supply circuit, along with all the power and signal wiring from the transmitters and power relays, is brought to the console through a single metal cableway. All circuits terminate at terminal blocks in distribution boxes located in the console.

The controllers and recorders have internal circuit protection; however, additional protection is required to isolate separate systems from the main feeder. In the recording system, the circuit protection is arranged to isolate both the recorder and its associated transmitter in case of failure of either. The protection for the control system removes the transmitter, recorder, and controller in case of failure in either, and separate circuit protection is provided for the manual control and power relay. This permits the valve to be operated manually from the control house in case of failure in either the transmitter, recorder, or controller. It is also possible to have a record of the controller variable while on bypass control in case of failure in the power relay.

There are individual mercury-type control power switches for each recorder and its transmitter, each controller and its recorder and transmitter, and each manual controller. These are all accessible from the rear of the console. The mercury switches have one disadvantage—if the console is accidentally jarred, the mercury contact is momentarily broken. This brief interruption of power does not upset the control action, but it does produce "pips" on the recording charts.

Emergency Instrument Power System

Rather exacting emergency power requirements were imposed by the instrument manufacturer to insure continuous operation of the instruments at their guaranteed accuracy. These requirements were: (1) A maximum of 3-second interruptions, and (2) supply to have a plus or minus three-cycle per second frequency regulation. (The voltage regulation was not critical, since

"Speed of response is definitely faster as compared to similarly installed pneumatic types. However, because of the limitations of pneumatic control valves, it has not been possible to take full advantage of this feature."

power is fed through a constant voltage transformer.)

Steam turbine . . . An existing emergency power system supplied by a 20-kw. steam turbine was available in a nearby process unit. Tests indicated this turbine generator required 5 to 10 seconds to come from rest and deliver rated voltage. To meet the 3-second requirement, it was necessary to install a special emergency system for instrument and control power. This auxiliary unit is continuously operating and capable of delivering power immediately when called upon.

The installation consists of an a.c. motor, an a.c. generator, a d.c. unit (motor or generator), all on the same shaft, a storage battery, and a control cabinet. The unit rotates continuously. Normally the a.c. motor drives the a.c. generator and the d.c. unit, which acts as a generator to maintain the battery in a fully charged condition. If power fails, the battery supplies power to the d.c. unit, which acts as a motor to drive the a.c. generator.

Battery . . . This will supply the load of the console for about ½ hour. To conserve the battery and to permit emergency operation for longer than ½ hour, the instrument system load is transferred to the previously mentioned 20-kw. turbine generator as soon as it is up to rated speed and voltage.

Experience indicates that the emergency power requirements imposed were more exacting than necessary for this plant. Since the purpose of this plant's emergency system is only to bring the unit to a gradual shut-down, extreme accuracy is not required. Field tests, plus an unexpected complete power failure, indicate that instrument power may be off for up to 10 seconds and still maintain satisfactory control for making an orderly shutdown of the unit.

A single metal cableway carries all wiring between console, transmitters, thermocouples, and power relays. It is mounted on pipe supports and is T-shaped in its layout. One leg runs the entire length of the plant, and from it another leg is sent through the reactor-furnace section.

This type of construction was chosen over conduit for its initial economy of material and labor and its future flexibility.

All wiring consists of multiconductor cables. Instead of providing spare conductors in each cable, several spare cables of each of the above types were included in the original installation. These spare cables extend the full length of the duct system and thus may be picked up at any point desired.

Transmitters and Power Relays

There is little difference between the installation of the transmitters and power relays and pneumatic equipment. The transmitter should be mounted as close as possible to the measuring take-off point for accuracy and rapid response, yet mounted at convenient height for maintenance and calibration. The pressure and differential pressure transmitters can be calibrated by hanging dead weights from a point at the rear of the transmitter lever assembly. (See Fig. 3). To take advantage of this feature, the transmitter must be mounted upright and with no obstruction at least 18 in. below it.

Transmitters are equipped with their own dampening device, which permits the transmitter to be mounted in areas of normal vibration generally found in refinery work without special precautions. In locations subject to unusual vibration, it has been found necessary to provide separate and more rigid mounting, rubber vibration absorbers between the mounting bracket and the transmitter, and a section of flexible hose in the metering lines. Power relays are not equipped with any internal dampening and are rigidly mounted.

During startup, the optimum settings for proportional band, automatic reset, and rate action were found by the usual cut-and-try procedure.

Settings . . . The standard controller has a range of 2 to 200 per cent proportional band, .03 to 20 repeats per minute automatic reset action, and .05 to 8 minutes rate action. Standard controllers are used for the three temperature controls, while flow and pressure controllers have standard proportional band with a fast-acting automatic reset action (.03 to 240 repeats per minute), but no rate action.

Faster system . . . The adjustments made during startup clearly indicated that faster rate times are possible with the electronic system than with a pneumatic system. Direct comparisons were not made. But it is estimated, based on past experience, that rate times used in this installation are 50 per cent faster than for a pneumatic system. The faster rate times make it possible to hold the controlled variable within a closer tolerance to the set point. Optimum settings for portional band and automatic reset action were found to be comparable to similar settings for a typical pneumatic system.

Equipment Problems

The few difficulties that have been experienced have been of a type common to instruments in general. For example, several chart-drive motors have failed. But the plug-in feature of the instruments greatly simplifies this problem. A spare recorder can be placed in service and the faulty instrument repaired more conveniently and quickly in the instrument shop.

Repeated failure of a flow transmitter metering the recycle gas on the discharge header of four compressors occurred. This transmitter was subjected to two unfavorable conditions. (1) Considerable vibration which existed at its mounting and throughout the compressor house; (2) the pulsating flow of the gas being measured. Providing a rubber cushion between the transmitter and its mounting bracket and inserting sections of flexible metal hose in both metering lines relieved the vibration condition. However, failures continued, and the problem was found to be more pulsation than vibration. The use of pulsation dampeners and a heavier assembly for the transmitter supplied by the instrument manufacturer solved the problem.

Operating Advantages

Speed of response of the instruments is definitely faster as compared to similarly installed pneumatic types. However, because of the limitations of pneumatic control valves, it has not been possible to take full advantage of this feature. There is considerable concentration of engineering effort under way to remove this obstacle, and undoubtedly more suitable control valves will be available soon.

Accuracy . . . For the electronic measuring recording system this is 0.5 per cent. Unstable calibration has always been a problem with older types of instruments. However, the inherent stability of electronic instruments makes it possible to maintain accurate calibration for indefinite periods of time.

Another operational advantage of this type of equipment is the fact that the recorder pen is completely dissociated from the controlling action. Thus accidental deflection of the pen during inking operations, etc., does not affect control action.

Maintenance-Training

Plant personnel handle the maintenance of this equipment. The equipment employs time-proven electronic circuits

and components. The number of tubes, the circuit arrangements, and the components are, in fact, less complicated than the familiar home radio. However, a training program was set up for both operating and maintenance personnel.

Test Facilities

A special test setup is shown in Fig. 3. This is built around a portable Swartwout test unit which supplies simulated transmitter and set-point signals and which is so mounted in the panel to be easily removed for field checks. The bench also incorporates an adjustable voltage supply, an adjustable and regulated air supply, a voltmeter reading supply voltage, and a milliameter for controller output current. A vacuum-tube voltmeter is used to reach check point voltage when the setup is used for maintenance work.

Maintenance Procedures

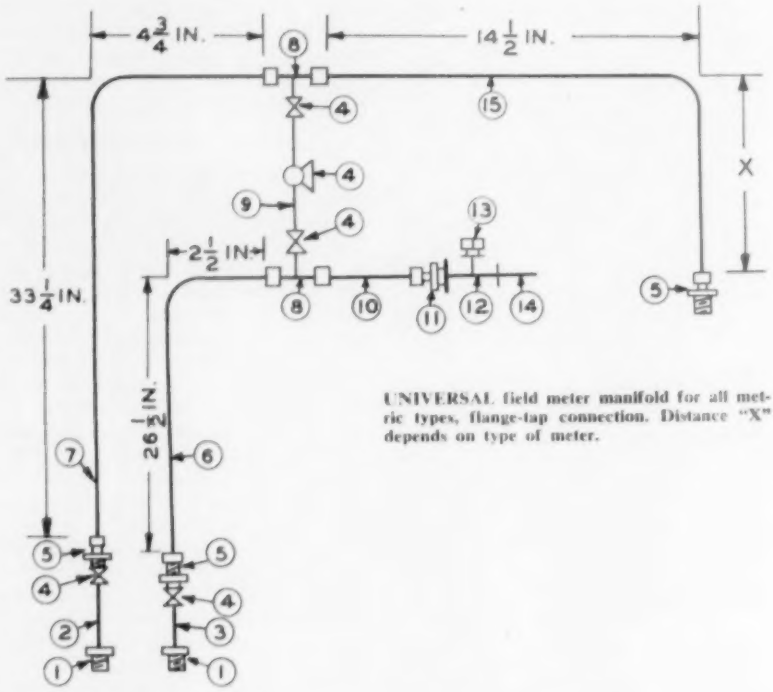
Field-mounted units, such as transmitters and power relays, are repaired on the spot if possible. Console-mounted instruments, being of the plug-in type, are returned to the instrument shop, where they can be maintained more efficiently. It is comparatively easy to isolate a system failure to a particular unit, i.e., recorder, controller, etc. If the faulty unit cannot be conveniently or quickly repaired on the site, it is replaced with a spare instrument. The faulty unit is then set up on the test bench, and through a system of check-point voltages, the trouble may be isolated to a particular section or component. Once the trouble is located, the unit is repaired and recalibrated and then placed in stock as a spare.

Consistent and stable calibration and the ability to accurately preset control functions permit random interchange of units of the system. In addition, the ability accurately to preset control functions makes it unnecessary to go through a cumbersome "in service" cut-try adjustment procedure when interchanging controllers.

Maintenance Experience

There have been no tube failures to date. A program of tube replacements at regular intervals has not been established but will be considered when sufficient data on tube failures are accumulated. It is interesting to note that industrial long-life tubes are used for the controllers, while standard tubes are used for the recorders. Since a recorder can be removed for repairs or tube replacement without disturbing control action, the use of industrial tubes costing approximately five times as much as standard tubes appeared uneconomic.

A complete stock of all necessary component parts for all anticipated maintenance has been established. In addition, complete spare recorders, controllers, transmitters, power relays, etc., are stocked on the basis of 1 spare unit for every 10 units in service with a minimum of 1 spare unit of each type. Based on operations to date, it appears that the number of spare units could be safely decreased.



UNIVERSAL field meter manifold for all metric types, flange-tap connection. Distance "X" depends on type of meter.

How Phillips Improved Fabrication Of Orifice-Meter Manifolds

UNTIL recently, the orifice-meter manifolds fabricated for all meter installations of Phillips Petroleum Co.'s natural-gasoline department were made from threaded connections. The disadvantages of using threaded connections were the excessive leakage and distortion of the manifold as well as damage resulting during shipping.

R. O. Ellis and E. D. Yeager developed an improved manifold using ⅜-in. steel tubing and tubing fittings containing 15 joints as shown on the drawing. This new manifold facilitates rapid field installation, reduces possibility of leakage, permits shipping with minimum chance of damage, and effects a saving in materials and assembly time. In addition, meter freezeups are reduced.

Other companies might have different ways of doing a meter-manifold job. But the layout shown here, while perhaps not directly applicable to all other meter-manifold installations, nevertheless offers a good example of what can be done along this line.

TABLE 1—LIST OF MATERIALS

Item	Description—	Req'd
1	¼ by ½-in. steel bushing	2
2	¼ by 8-in. steel, extra hvy. nipple	1
3	¼ by 6-in. steel, extra hvy. nipple	1
4	¼-in. metric type No. 7654 M-I needle valve	5
5	Ferulok ⅜-in. No. 6FBU-S, male conn.	3
6	⅜ by 29-in. long steel tubing—flared*	1
7	⅜ by 38-in. long steel tubing—flared*	1
8	Triple-lok ⅜-in. No. 6 FTBX-S, ¼-in. male outlet tee	2
9	¼-in. welded tee	1
10	⅜ by 2½-in. long steel tubing—flared*	1
11	Triple-lok ⅜-in. No. 6 FTBX-S male conn.	1
12	¼-in. steel 3,000-lb. tee	1
13	¼-in. steel head hex. plug	1
14	¼ by 2-in. steel extra nipple†	1
15	⅜ by 22¼-in. long steel tubing—flared on long end*	1

*0.049-in. wall for bending. †Item 14 will be ¼ by 1-in. steel nipple for metric pear-shaped type B, M&S cases. B = whole door; M = hinged top flap; and S = screwed top flap.

What Plantation Learned In 2 Years of Operating Unattended Pump Stations

"Design for maximum safety, use the best equipment available, and coordinate electrical and mechanical maintenance." These are the authors' recommendations based on experience with five remotely controlled pump stations. Here's a valuable account of that experience.

by T. V. Bockman and R. S. Cannon

UNATTENDED STATION is controlled over microwave link, and has switchgear and control equipment in separate building from pump room. Fig. 1.

NO pipeline design engineer can be blamed for wanting to install an unattended, remotely controlled pumping station. However, operating experience with a few such stations may dampen his enthusiasm somewhat. There is still much development work to be done in this field.

Plantation Pipe Line Co. has five remotely controlled, unattended stations in operation. We do not mean that these stations have not been satisfactory; on the contrary, we are well pleased with them and expect to build more in the future. However, our operating experience may be of interest to the industry in indicating desirable design features, equipment which needs improving, and necessary maintenance procedures.

Authors are with Plantation Pipe Line Co. Paper was presented to the sixth annual products pipeline conference of the American Petroleum Institute's Division of Transportation, Chicago, May 16-18, 1955.

Design for safety . . . First of all, an unattended station must "think for itself." It must protect itself and its neighbors from any hazards it may introduce. Good design can make the protection job much easier.

For example, an outdoor pump station is practically defenseless against sparks from a forest or grass fire. Thus the pump and all small valves, piping, and other equipment which might leak products should be housed in a good substantial building with a concrete floor, drained to an underground sump tank. This building should have an exhaust fan, and air should be drawn in through nonflammable filters. A further worthwhile precaution against exterior fires is a 25-ft. wide strip of concrete pavement around the building, with trees and brush cleared out for 150 ft. away from the building.

Confining all leaks inside a building, where they can be drained to a sump, gives more protection. A float switch on the sump tank operating on high level can shut down the station and close station valves, thus preventing product from spreading over the countryside in the event of a bad leak.

All equipment and wiring in the pump building should, of course, be designed for Class 1, Group D service. Whether the main motor should be explosionproof or enclosed force-ventilated may be debatable. But the explosionproof motor does not require additional gadgets—which could fail—to make it safe, while the force-ventilated type does.

Because it is impractical to make the station control equipment and switchgear explosionproof, explosive vapors must be kept away from it. If the control gear is in a room adjoining the pump room, equipment is required to

PUMPING EQUIPMENT at Smith station consists of 800-hp. main unit and 5-hp. sump pump. Experience dictates thorough testing of main and auxiliary equipment. Fig. 2.

MICROWAVE EQUIPMENT at Bremen station. Short-lived tubes are a source of trouble. Fig. 3.

CONTROL ROOM at Bremen station. Panel at left houses supervisory control for remote station. Main console controls local functions. Fig. 4.

keep a pressure differential between the two rooms and to check for explosive mixtures in the control room.

At little or no additional expense the control gear can be located a safe distance away from the pump area, either out of doors or in a separate control building. Our preference is for a separate control building, 50 to 150 ft. from the pump building, depending on relative elevations. Troubles always seem to develop on cold rainy nights, and it is a bit difficult for the electrician to concentrate on a complicated wiring diagram and hunt for trouble when he is wet and cold.

Recommended layout . . . Fig. 1 shows the general layout of one of our single-unit stations. It is remotely controlled over a microwave link from an attended station about 50 miles upstream. Two such stations are located on an 8-in. branch line from Bremen, Ga., to Knoxville, Tenn., and both have been in operation about 2 years. The small building in the foreground houses the radio equipment, channel multiplexing equipment, and a 6-kw., standby diesel generator. In the larger building on the right are the main pump (800 hp.), 5-hp. sump pump, and all station valves, piping, and the like, as shown in Fig. 2. The control and switchgear equipment is in the building to the left. In the background can be seen the incoming and outgoing station block valves, near which are located the electrical pick-ups to detect passage of scrapers.

Equipment in these stations has, in general, been satisfactory. However, there are some changes, as will be discussed later, which we feel would be desirable. The arrangement of buildings and the layout of equipment we still feel is safe and about as good as any other unattended stations we have seen.

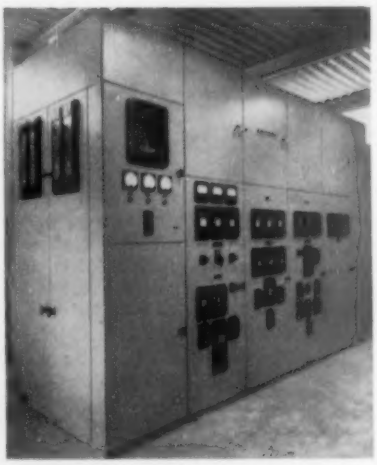
Equipment test . . . In our opinion no equipment is too good for such an application. An unattended station is certainly no place to economize by using "dime store" gadgets. Even after buying the best equipment available, a lot of grief can be avoided by testing it—not just a simple final-sequence test, but a thorough check and test of each individual component.

Of course, all reputable equipment is guaranteed, but it would be small comfort, after blowing up a $250,000 station because of failure of a $25 relay, to find that the manufacturer will gladly replace the relay, provided you send him the old one back freight prepaid and install the new one yourself. The manufacturers of the mechanical equipment are not blameless either. One of our pumps, specified to be tested at 2,000 lb. and bearing a name plate stating that it had been tested to 1,500 lb., leaked through a sandhole in the case at 500 psi.

We have not blown up a station or even set fire to one. But some things have happened which, with other types of station design or under different circumstances, could have resulted in serious damage.

Recommended Equipment Changes

Lubricated plug valves were used in our stations for motorized station and pump valves. Since most of these stations are on lateral lines and make frequent starts and stops, a utility man has to make two to four trips a week to the unattended stations to lubricate the valves. Unless some good means of automatic lubrication can be devised for the plug valve, a nonlubricated type of valve is preferable.



SWITCHGEAR cubicles at unattended station. Fig. 5.

On the first four of our stations, the pressure controllers used have hydraulic-pressure sensing elements. At the last station built, electrical strain-gage pressure-sensing elements were used to power the pneumatic controller. The electrical system is more accurate and requires less maintenance. Further it eliminates small product piping which is always a source of leaks and other troubles.

As for the pneumatic controller and air-operated throttle valve, we are not too happy with these. We hope an all-electric controller and throttle valve will be devised. In spite of compressor aftercoolers, moisture traps, filters, and the like, we are still plagued with frozen air lines to the throttle valve in the winter.

As mentioned before, small product lines are a constant maintenance problem. They leak and plug up with scale.

Some of the station emergency-shutdown devices, such as high and low pump-suction pressure and high outbound-line pressure, are dependent for operation on the small product lines. This is a weak link in the protective system, and we are trying to devise something more reliable.

Some of the scale which plugs up the small product piping could be kept out by adequate filters. However, we feel that these would only create an additional maintenance problem, and we use only simple strainers to protect the main pumps.

We have had difficulties with wire bristles lost from scrapers. Occasionally, one of these will go through the strainer and pump and will lodge in the station throttle valve, causing the valve to stick. We are experimenting with a magnetic device to install in the strainer to catch the stray scraper bristles.

Controllers . . . To prevent surging of the line and overloading of the motor during the line-packing period, we installed flow controllers at the first four stations. These use differential-pressure electrical strain-gage sensing elements across orifice plates, and the small piping to the differential-pressure cells has been a source of leaks. Furthermore, this system complicates the main-station piping because of the necessity of installing straightening vanes and straight runs of pipe above and below the orifice plate.

On our most recent station, a load controller, operating on main-motor loading, was substituted for the flow controller. Where it is not necessary to telemeter flow back to the control point, we feel that the load controller is preferable to the flow controller. It costs less, requires less maintenance, and will permit more flow on light products.

Supervisory Control and Telemetering

We have two small stations, each with one 300-hp. main pump, operating without supervisory control. These are on 4-in. branch pipelines. Remote start and stop is done by dialing over the teletype circuit.

The control point in both cases is the originating point for the line. The operator, by watching his pressures and flow, can tell when the remote station is operating. Even for such small and relatively unimportant stations, we now feel that simplified supervisory control and telemetering of at least station-suction and outbound-line pressures is desirable.

On two single-unit, 800-hp. stations on an 8-in. lateral line, we went overboard on supervisory control and telemetering, and wound up with this equipment costing us $38,000 per station. Experience has shown that some of the intelligence brought back to the control point from these stations is not necessary. By grouping some of the fault indications on the same supervisory point, the cost of adequate supervisory control and telemetering for a single-unit station can be brought down to less than half the above figure.

". . . an unattended station must think for itself and must protect itself and its neighbors from any hazards it may introduce. Good design makes the job easier."

Transmission methods . . . The problem of whether to purchase microwave radio or to lease telephone circuits for remote control of an unattended pumping station is not, in our opinion, susceptible to a general solution applicable to all pipelines. We have both microwave and leased-wire control, and find that both give better than 95 per cent reliability. At the present time we feel that, for our system, leased wire is the most practical and the most economical. However, where there is a legitimate use for the additional channels which can be added at very little expense on the radio, there would undoubtedly be applications in which the microwave would be preferable.

Fig. 3 shows a view of the 2,000-megacycle microwave equipment—with doors removed—installed at Bremen station, the originating point for the 152-mile radio system.

Fig. 4 shows a portion of the control room of our Bremen station, which is manned. The second wall panel on the left shows the station diagram, control buttons, indicating lights, and the pressure gages and flow meter for an unattended station about 50 miles away.

Maintenance Procedure—Radio

Inasmuch as we have only 152 miles of microwave radio, with seven radio stations (of which three are repeaters), we do not have a radio department. We have one combination electrician and radio technician, with a helper. They take care of normal maintenance on the radio and also the electrical maintenance of two unattended and one attended pumping stations along the route of the radio. Radio-tower maintenance, including lamp changing, is contracted.

Our two men have a panel truck assigned to them to carry their tools and the usual instruments necessary for radio and electrical maintenance. In addition to the three aforementioned stations, these men look after the radio equipment at three repeater stations located along the 152-mile route. Also, these maintain two sets of carrier equipment used to control an unattended booster station on the main line 26 miles from headquarters. The audio carrier is used to multiplex a leased-wire, voice-grade circuit over which the station is controlled. It includes two channels for supervisory control (with automatic transfer), four telemetering channels, and two channels for emergency start or stop (in case of failure of supervisory control). The carrier equipment was placed in service in September 1954, and to date has required no maintenance.

Headquarters for these two men is at our division office at Bremen, Ga. It was found most desirable to locate them there rather than at some point in the middle of their work area. Bremen is the critical point for radio control, since the radio frequency at Bremen determines the operating frequency for all the other radio stations in the division. Also, the supervisor responsible for maintenance work has better control of working conditions, and is in a better position to pass on information from higher echelons of management.

Our radio system has been in operation since September 1953. During the first 4 months of operation the equipment manufacturer furnished us a technician for trouble shooting and to train our maintenance personnel. Since that time our maintenance men have been entirely on their own, and our system has not been out for longer than 2 hours up to now.

Having complete standby RF equipment at each location has been of great help; otherwise, our system would have been useless at least 25 per cent of the time. However, we feel that our men, with no previous electronic background at all, have done an outstanding job in keeping up our equipment.

The fact that we have two different means of voice communication between all locations has been a help in maintaining our system. One of the voice-communication devices is a clear-channel voice telephone which is connected between our division office and all the pumping stations. The other is a service telephone which is connected between all the radio buildings of the system. This service telephone operates over the radio alarm and control channel.

In addition to the radio equipment, these men service the batteries for the auxiliary power plants in the radio buildings and the batteries for the switchgear, make adjustments to pressure and flow controllers and protective pressure switches, and assist in switch-

"Mechanical and electrical departments work closely on maintenance. Thus one department can often make repairs on the other's equipment without calling on their men for a special trip."

gear repair work. Their radio work includes checking the output and frequency of each station, changing out filters in the cooling-air system, and keeping the equipment clean and in good operating condition.

We have had the usual number of tube failures, blown fuses, burnt-out resistors and capacitors, and open circuits in relay coils. Tube life has not come up to expectations; in the past year we have replaced $1,600 worth of tubes of one kind alone.

Moisture in the coaxial cables on the towers has caused us a great deal of trouble and the tower maintenance crew a lot of work in changing out gaskets at coaxial-cable joints.

Radio operation in general, however, has been good. We attribute a large part of this to the excellent maintenance our crew has been giving the equipment. We feel our system is an easy one to learn and is one which can be worked on with a minimum of trouble.

Mechanical Maintenance

The division mechanical crew, consisting of a foreman and three mechanics, takes care of the mechanical maintenance at our remotely controlled stations in addition to the other stations in the division.

This group is responsible for repair of pumps, air compressors, water pumps, and valves, and for the mechanical repair of the 800-hp. pumping motors. Their repair work on the 800-hp. motors includes replacement and fitting of bearings as necessary, checking alignment and spacing, and replacement of worn oil rings. This group travels in a truck with a special panel-type body capable of carrying a complete rotating element for the large pumps and all other repair parts necessary for their work.

In addition, the mechanical group services the seven diesel engines used to drive the 6-kw. emergency-power generators in our radio buildings.

On the original installation we did not have purchased power at two of our repeater stations, so two diesel engines were installed, one running continuously with automatic transfer to the standby unit in case of failure of the normal engine or generator. This proved troublesome, because the engines used a large quantity of oil and several of the generators failed.

We have since installed a new type of generator at all locations and have obtained purchased power at all locations. This has greatly reduced the maintenance costs at these locations. Now we do not have to make a trip to these locations every 10 days to check the diesel-fuel storage tanks, diesel engines, and generators.

Our mechanical maintenance record has been very good. It has been necessary to replace one 800-hp. motor at one of the stations because of an explosion seal working loose and throwing a whip in the rotor shaft. This we feel was a manufacturing error and not the result of poor maintenance. We have had the usual pump mechanical-seal trouble caused by welding beads, scale, and dirt from new sections of pipeline adjacent to the stations.

Some difficulty was experienced with hydraulic nonslam check valves, between the suction and discharge of the pump, failing to close after a scraper run when the pump was restarted. After eliminating the nonslam and hydraulic features of this check valve, we have had no further trouble.

The mechanical and electrical departments work together very closely on maintenance at a remotely controlled station. One department can often make repairs to the other department's equipment without calling out their men to make a special trip to the location. Inasmuch as the supervisory control diagram at our attended pumping stations is arranged to distinguish between electrical and mechanical troubles in the equipment at the remotely controlled stations, the job of maintenance is greatly simplified.

Electrical Maintenance

Our electrical crew consists of three well-qualified electricians. These men do all major repair and maintenance work on the four remotely controlled stations, plus all other electrical work in our division, consisting of six other pumping stations, four terminals, and the division office. These electricians check the oil circuit breakers, pumping motors, auxiliary motors, and other equipment at definite intervals.

We have found that keeping a set of equipment cards at the remote station and a duplicate set at our division point helps in scheduling necessary repair and maintenance work without interfering with normal pumping operations. These cards have a complete history of each piece of equipment, showing the services performed and its general condition. By taking advantage of seasonal ups and downs in throughput, we can schedule major maintenance at times of less demand for use of the stations.

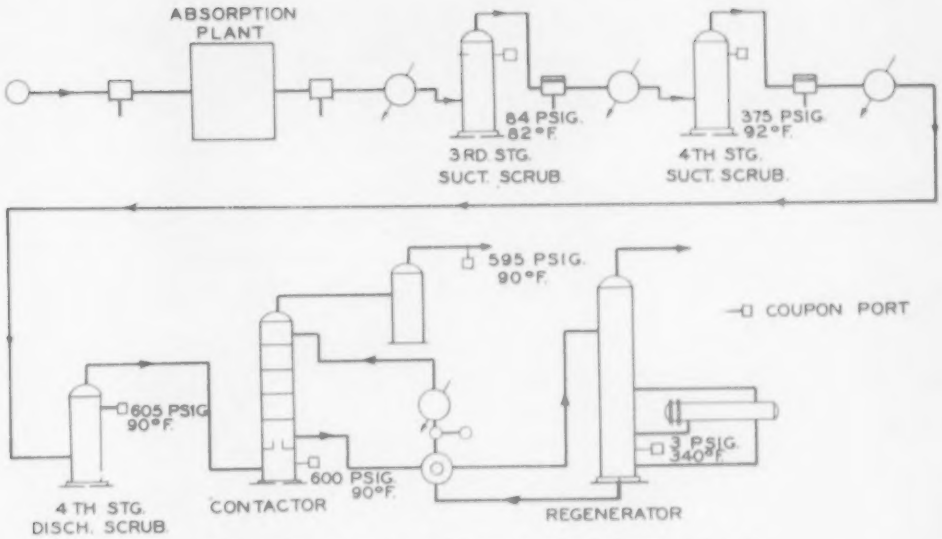
Equipment at these remote stations is as nearly foolproof as we can make it. All switchgear is completely metal-enclosed and of dead-front construction, as shown in Fig. 5.

All motors in hazardous locations are explosionproof and are of squirrel-cage induction design for safety and ease of maintenance. We do not allow maintenance work to be done at these locations unless there are two men present. This eliminates the possibility of a man becoming sick or injured and not having any way to let us know his condition so we can get help to him. In our 2 years of operation of these stations, we have never had an accident or injury, so we feel our precautions have been well worthwhile.

For transportation these three electricians use a pickup truck with all necessary tools, instruments, and some repair parts carried at all times. We do not carry repair parts for every trouble possible. The supervisory control board gives us a good indication of what trouble is present. We can then pick up repair parts at our division warehouse before leaving for the job.

Either our electrical crew or our radio crew can perform minor maintenance work or trouble shooting on the electrical equipment. Whichever crew is closer to the job is sent to clear up troubles and get the pumping units back on the line. We feel that by not allowing our radio crew to specialize in radio work, we can get more useful service from them, and they will become more familiar with opeartions as a whole.

Electrical troubles have been of a minor nature in all of our remotely controlled stations. None of the troubles experienced have caused a shutdown of the station for more than a few hours. Included in our minor troubles have been frozen air lines to pneumatic pressure controllers, stopped-up tubing lines to protective pressure switches, failure of timing relays in our sequence-control setup, blown fuses in our battery and flow-controller circuits, and burnt-out coils on breaker-operating mechanisms. We believe that the time spent in selection of the electrical equipment for these stations, as well as an intensive training program for our electrical maintenance men, has paid off big dividends when it comes to locating and repairing electrical troubles.



SCHEMATIC gas flow and dehydration unit flow diagram. Fig. 1.

Here's an Effective Corrosion-Control Program

. . . for a glycol gas-dehydration unit

by Will Swerdloff and Maryann Duggan

A CONCENTRATED program for reducing corrosion on a unit dehydrating gas with diethylene glycol has shown these results:

- Corrosion has been reduced in the rich glycol solution, the lean glycol solution, and in the dried-gas line.
- Corrosion test coupons give indications of the effectiveness of the control program, but inspections of the equipment are needed for complete evaluation.
- Continual attention must be given to the details of the program if maximum benefits are to be realized.

Authors are with Magnolia Petroleum Co., Dallas. Swerdloff is in natural-gas department, and Duggan is with field research laboratories. Paper presented at N.G.A.A. annual meeting, Dallas, April 13, 1955.

Installation . . . The dehydration unit with which we are concerned was put into operation by Magnolia Petroleum Co. late in 1947. The diethylene glycol solution passes through the heat exchangers to the reactivator (Fig. 1). Here it is stripped of absorbed water so that the glycol can be returned to the contactor after being cooled by the heat exchanger and aftercooler. Typical temperatures and pressures are:

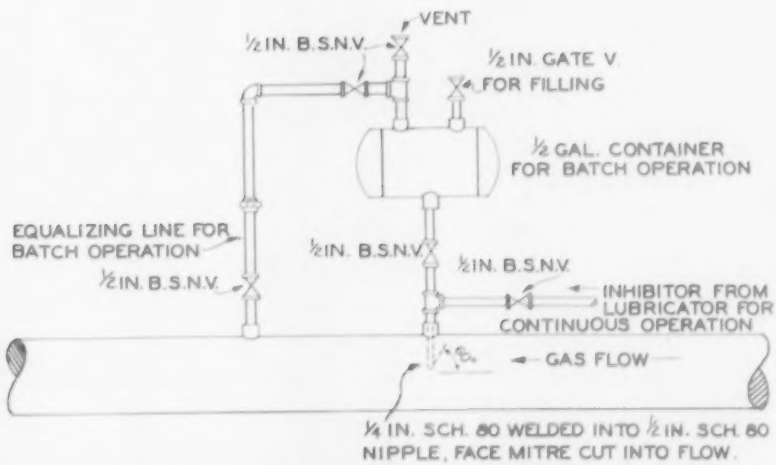
	Temp. °F.	Pres., psia.
Gas to contactor	85	
Gas from contactor	88	600
DEG from contactor	87	
DEG to regenerator	170	
DEG from regenerator	340	3
DEG to contactor	110	

As shown on the flow sheet, the dehydration unit follows four stages of gas compression. The natural-gasoline absorber is at the end of the first stage. All equipment in the original glycol unit was carbon steel. The gas to the dehydrator is sour, as is indicated by the last analysis of nonhydrocarbon components:

H_2S	58 grams/100 s.c.f.
Mercaptans	54 grams/100 s.c.f.
CO_2	1.36 per cent

This analysis is representative of the gas throughout the corrosion control program.

In June 1949, first indications of difficulties because of corrosion were


VENT
½ IN. B.S.N.V.
½ IN. GATE V. FOR FILLING
½ GAL. CONTAINER FOR BATCH OPERATION
EQUALIZING LINE FOR BATCH OPERATION
½ IN. B.S.N.V.
½ IN. B.S.N.V.
½ IN. B.S.N.V.
INHIBITOR FROM LUBRICATOR FOR CONTINUOUS OPERATION
GAS FLOW
¼ IN. SCH. 80 WELDED INTO ½ IN. SCH. 80 NIPPLE, FACE MITRE CUT INTO FLOW.

ARRANGEMENT for batch or continuous injection of corrosion inhibitor. Fig. 2.

noted. The solution filter elements required frequent change because of accumulation of iron sulfide compounds. It was estimated that about 7 lb. per week of such material was being removed. The filter elements required change about every 7 to 9 days. Glycol solution began to accumulate in the gas-scrubber section beneath the contactor trays.

The unit was shut down and inspected. The reactivator was fairly clean with little apparent corrosion. Some, but not excessive corrosion appeared on both the rich and lean sides of the exchangers. Considerable deposits of iron sulfide had settled out in the heat exchangers. The contactor showed severe corrosion. There were scattered pits about ⅛-in. deep. Contactor traps were 10-gage carbon steel.

The most severely damaged portion of the contactor was in the chimney tray which divided the inlet-gas separation space from the contactor trays in the first two trays.

In December 1950 the dried-gas line blew out about 80 ft. downstream from the contactor. This was Schedule 40, 4-in. pipe that had been in service about 4 years. In May 1951 a rupture occurred in one of the dried-gas meter runs. This was a Schedule 40, 6-in. pipe that had been in service about 4 years.

Corrosion-Control Program

In 1949, when our troubles were first noticed, we began an investigation of the glycol solution. We found that the pH of the solution ranged from 4.1 to 5. One analysis showed 0.035 wt. per cent H_2S and 0.018 wt. per cent CO_2. The pH of an entrained liquid sample was 3.6.

In September 1949, after success with stainless-steel coupons, the contactor was equipped with a stainless-steel lining and stainless-steel trays. The material was 25-20 Type 310 stainless steel.

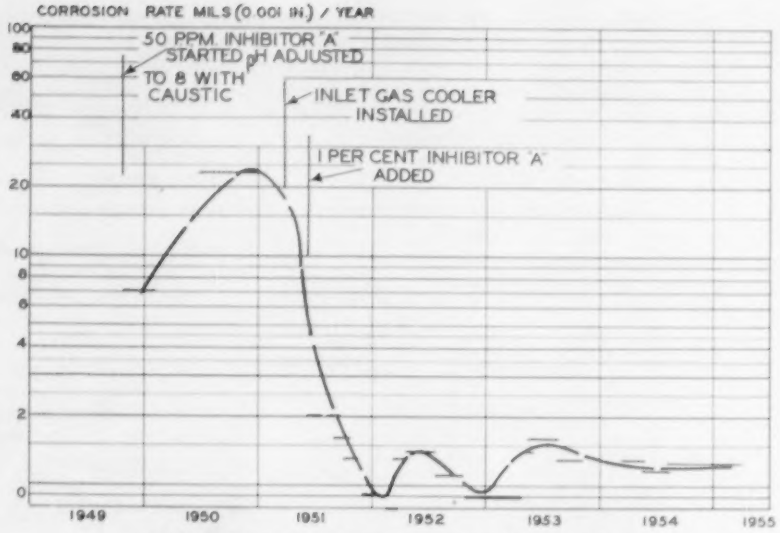
In October 1949, prior to the blow-out in the dried-gas line, a program was started using 50 p.p.m. of Inhibitor A in the glycol solution. Inhibitor A is a 45 per cent solution in water of sodium mercaptobenzothiazole. Together with this inhibitor, caustic was added to maintain the pH of the solution at about 8. While this may have given some protection to the cold DEG solution, as is indicated in the accompanying figures, this method of protection was stopped several months later because of the high consumption of caustic by the acidic components in the gas.

In January 1951 the plant was visited to attempt to find causes of the corrosion. Several conditions were noticed:

1. The temperature of the gas to the contactor was excessive. We believed that if this temperature were lowered the chemical reaction producing the corrosion would at least be slowed down.

2. It was found that glycol entrainment was excessive. If the glycol were the cause of the corrosion, we believed that corrosion rates could be lessened by reducing the quantity of glycol entering the dried-gas line.

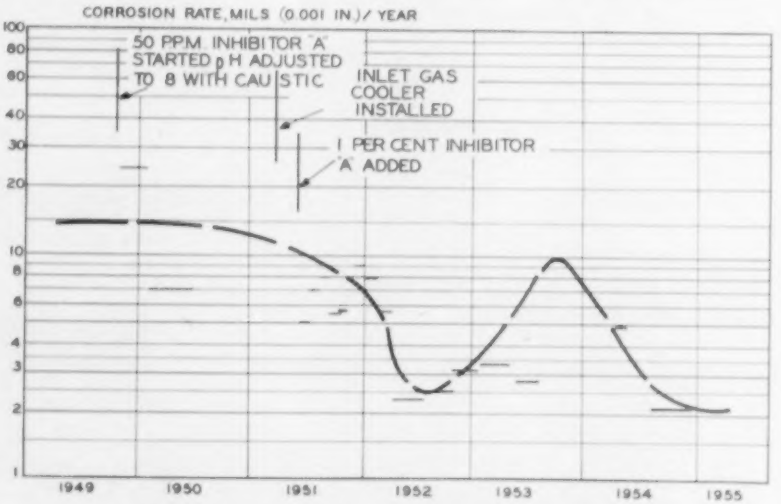
New gas cooler . . . As a result of recommendations, an additional gas cooler upstream from the dehydration unit was placed in operation at the end of March 1951. This gave us a drop in gas temperature of about 20° F., the temperature being reduced from 100° to 80° F. A dried-gas scrubber was installed in May 1951. As will become apparent in the figures, these changes give benefits.



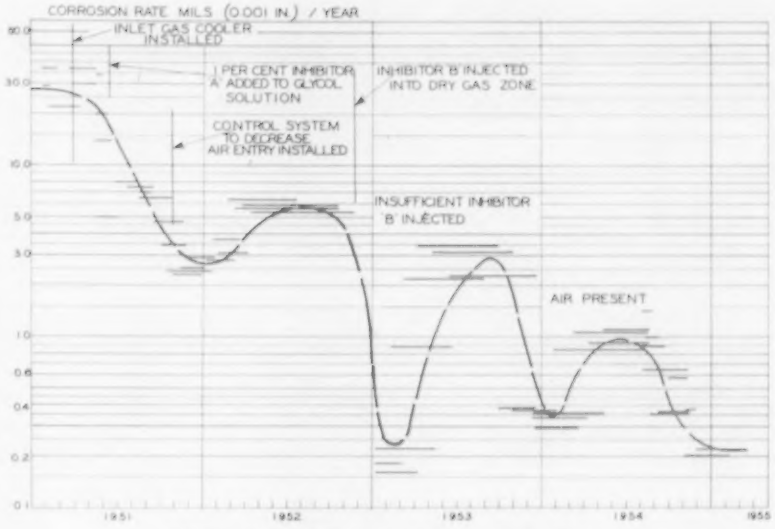
COLD RICH glycol solution coupon corrosion rates. Fig. 3.

The use of 1 per cent Inhibitor A in the glycol solution was started in June 1951. This was added to the solution holdup of the system and then to drums of makeup glycol. At present, 2,000 cc. of the inhibitor is added to the system twice each month. The volume of glycol contained in the unit is 450 gal.

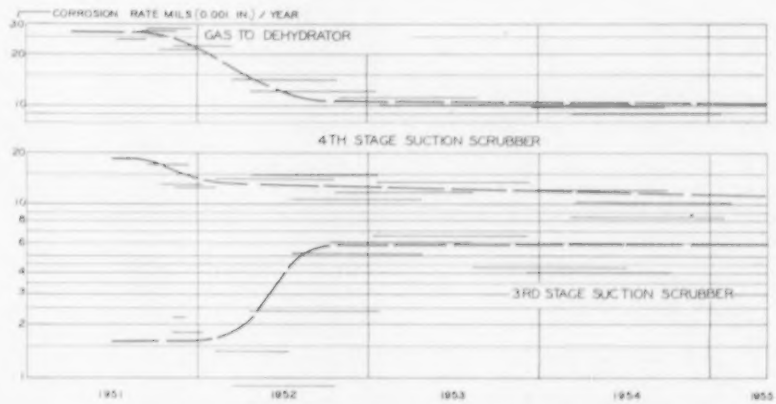
In October 1951 a system was installed to decrease the presence of oxygen in the gas stream. This consisted of admitting higher-pressure gas into the low-pressure inlet-gas line whenever the suction pressure of the compressors dropped to 1 psig. Contamination with oxygen was difficult to confirm since it was not present at all times. The oxygen content of the gas was confirmed on the sample with the mass spectrometer. The concentration of oxygen in the gas is related to the presence of vacuum in the gathering system.



HOT LEAN glycol solution coupon corrosion rates. Fig. 4.



DRIED GAS LINE coupon corrosion rates. Fig. 5.



COUPON CORROSION RATES upstream of dehydrator. Fig. 6.

These measures decreased difficulties resulting from the presence of the glycol in the dehydration unit and in the dried-gas line.

In October 1952 the injection of Inhibitor B was started into the dried-gas line. Inhibitor B is of the polyethanol rosin amine type.* The inhibitor is injected at the rate of 0.1 gal. per day. The gas volume is 6,000 M.s.c.f.d. The inhibitor can be diluted with kerosine to increase the volume for pumping.

Fig. 2 shows the injection equipment. The nozzle is ¼-in. pipe cut off at 45°, installed to meet the gas flow. The lubricator used for pumping is powered by the glycol circulation pump. The inhibitor coats the pipe. If an excessive amount is injected it may coat the surfaces to an undesirable extent.

*A 70 per cent solution in isopropyl alcohol of a mixture having the proportion of 90 per cent ethyloxylated rosin amine (11 moles ethylene oxide reacted with each mole of rosin amine) and 10 per cent free rosin amine.

Coupon Results

The effects of the steps taken to decrease corrosion can be discussed better by referring to the attached figures. These plot the corrosion rate versus time and also show the length of exposure for each of the corrosion coupons. The flow sheet, Fig. 1, gives the coupon exposure conditions and their locations.

Fig. 3 shows the corrosion rates of carbon steel coupons exposed to the rich glycol solution in the base of the contactor. The first coupon results are from exposures starting about November 1949, when 50 p.p.m. of Inhibitor A was being added and the pH was adjusted to 8 with caustic. Here the corrosion rate was about 7 to 9 mils per year. The coupons show that when this treatment was stopped the rate climbed to about 23 mils per year.

When the temperature of the gas was dropped, oxygen eliminated, and the higher percentage of Inhibitor A used, the corrosion rate decreased and approached 1 mil per year from about the beginning of 1952 up to the present. The figure shows rises and falls in the corrosion rates experienced by the coupons. One reason for this may be variations in the effectiveness of the oxygen-elimination program.

Lean glycol corrosion . . . Fig. 4 shows the effect of the treatment on coupons exposed to lean glycol in the base of the regenerator. The coupons exposed here show corrosion rates as high as 24 mils per year about the beginning of 1950. The spread of results also show that the hot solution is much more susceptible to variations in conditions. While we might say that the coupon corrosion rate has declined to about 2 mils per year, at the present, there has been much more variation in these results than in those obtained in the rich glycol.

Fig. 5 shows the corrosion rates for coupons exposed to the dried gas. The corrosion rate in this line has declined from around 30 mils per year to a present rate of 0.2 mils per year. Even the last peak of 1 mil per year is a great improvement over the original rate. The benefits obtained in the glycol solution are reflected in these coupon results.

The figure shows that the use of the cooler and 1 per cent of Inhibitor A in the glycol gave a decline to perhaps 7 mils per year in the corrosion rate at this site. When air was eliminated more effectively the rate dropped to about 3 mils per year. The peak about the middle of 1952, we believe, was caused by the entry of additional air.

When the use of Inhibitor B was started about November 1952, the drop in the corrosion rate is spectacular to about 0.2 mils per year. The next peak after these good results, about the middle of 1953, caused an investigation which showed that insufficient amounts of Inhibitor B was being added, because of a defect in the feed equipment. Instead of 0.1 gal. per day, 0.025 gal. was being added. When the rate of addition was corrected the corrosion rate dropped to 0.3 to 0.4 mil per year.

The next peak, about the middle of 1954, was caused by oxygen entering with the gas again. The last result, 0.2 mil per year, is what was obtained with effort being made to eliminate the oxygen and inject inhibitor at the correct rate. We believe this figure shows the attention that must be given to the details of a corrosion control program to obtain the maximum benefit. Inhibitor B also stopped hydrogen blistering of the coupons.

Dehydrator feed stream . . . Fig. 6 shows the corrosion rates of coupons

exposed to the gas upstream from the dehydration unit. At those locations there never have been any failures because of corrosion. For this reason it had been our thought that all the corrosivity imparted to the gas was related to the dehydration unit. The upper curve shows coupon corrosion rates for the gas to the dehydrator. These coupons were exposed in the compressor discharge scrubber.

Coupon results in the fall of 1951 show rates of about 25 mils per year. Coupons exposed through most of 1954 show rates of about 9 mils per year. These are indeed high. While we may have had some effect on the corrosivity of this gas by decreasing the presence of oxygen, the lower coupon results are for coupons exposed for a greater period of time. These latter coupons were exposed for periods that approach a year, whereas the initial higher results are coupons exposed for 2-to-3-month periods.

When we inspected the interior of this scrubber we found that all exposed parts were covered by a heavy, black scale. Audigage readings as are shown in Table 1 gave almost original thickness for this vessel which was installed in 1939. Knowing these results, we may say that these coupons corrode rapidly until a protective coating of corrosion products is formed. If we deduct the initial higher rate from these coupons, the net corrosion rate is about 6 mils per year.

Fourth-stage discharge . . . It is of interest that the corrosion rate of coupons exposed to the hot fourth-stage discharge, 190° F., was negligible, 0.1 mil per year. This shows that a water phase is necessary for the corrosion reaction

The middle curve shows coupon results for the fourth-stage suction scrubber. Here, too, there is a decline from about 16 or 17 mils per year to about 10 mils per year. Here again we may say that the corrosion forms a protective coating.

The bottom graph shows results for coupons exposed to the third-stage suction scrubber. Here it appears that coupons exposed for a longer period of time gave increased corrosion. The Audigage results, however, do not bear this out.

These coupon results are of interest in that they show that coupons themselves cannot be used as the final measure of the effect of a corrosion control program. It is also of interest that the coupon results for this lowest pressure location are lower than those for the higher stages. This probably is the effect of decreased partial pressure of the carbon dioxide at the lower pressure.

"Coupons themselves cannot be used as the final measure of the effect of a corrosion-control program. Continual attention must be given to details if best results are realized."

Effectiveness of Corrosion Control Program

In May 1951 the interior of the contactor was inspected. The stainless-steel lining and trays were in good condition. This agreed with results for stainless-steel coupons of 0.1 mil per year. The 2-in. glycol feed line was also replaced and cut into 2-in. long pieces. These showed slight corrosion. Inside diameters varied from 2.062 to 2.067 in. The nominal inside diameter of Schedule 40, 2-in. line is 2.067 in.

Late in 1951 the glycol solution which had been black with iron sulfide became a reddish-brown color similar to lube oil.

In January 1952 the glycol cooler was inspected and cleaned. It contained a thick deposit of black iron sulfide. An 18-in. section of fins at the hot inlet end showed corrosion. The first 2 in. were gone. The corrosion became less severe until it was very slight at 18 in. This inspection is of interest in that this equipment had operated since late 1947 during the time when corrosion was severe and into the time when corrective measures were taken.

Heat exchanger . . . In March 1955, the glycol heat exchanger was inspected. Several leaking tubes were plugged and it was evident that the heat exchanger will require retubing or replacement in the near future. This is additional evidence that the inhibition of the hot solution is not as effective as that of the cold. Of course the heat exchanger has operated almost 8 years and at the time when the corrosion had been very severe.

In October 1952 the regenerator was inspected. Some corrosion was found but not to a severe extent. Pits in the manway cover were 1/32 to 1/16 in. deep and ¼ to ¾ in. in diameter. The trays are 10-gage carbon steel. Some pits were also evident on the walls. Since this vessel operates at about atmospheric pressure, potential damage from corrosion is not too extensive.

A complete inspection of the glycol equipment is scheduled for the coming summer.

In March 1952 the fourth-stage discharge scrubber was inspected, as previously mentioned. A black deposit ⅛-in. thick was present on the manway cover plate and vessel walls. The cover plate was cleaned and one pit 5/64 in. deep and 1 in. in diameter was found. One pit ¼ in. in diameter by 1/64 in. deep was found in the wall area that was inspected. This is evidence that the product of corrosion forms a protective covering upstream of the dehydration unit.

Audigage inspections . . . Table 1 gives Audigage inspection results for various locations. Only one set of data obtained in November 1954 is presented because of a change in the Audigage model. It can be seen that corrosion is small. Those points where readings are greater than the original thickness may be caused by mill tolerances on the plates. Additional readings must be obtained to determine the rates of corrosion. However, it can be concluded that the rates are not severe, at least for the points tested.

The contactor and scrubber piping was replaced in 1953, because thickness readings could not be obtained at some of the points with the Audigage. Inspection of the removed pipe showed that the interior was covered with a deposit. When the deposit was removed the Audigage gave an average thickness of 0.272 in. Micrometer readings based on an outside diameter of 6.625 in. gave an average wall thickness of 0.277 in. This line had been installed late in 1947. The pipe had a 0.280-in. wall thickness.

TABLE 1—AUDIGAGE INSPECTIONS

Location—	No. of Points inspected	Date installed	Audigage results— Avg. (in.)	Max. (in.)	Min. (in.)	*Original thickness (in.)
6-in. dried-gas line	52	1947	0.243	0.253	0.233	†0.241
Contactor and scrubber piping	20	1953	0.278	0.280	0.276	0.280
Scrubber walls	7	1952	0.941	0.953	0.930	0.875
Third-state suction	5	1939	0.278	0.278	0.276	0.25
Fourth-stage suction	5	1939	0.680	0.687	0.671	0.6875
Fourth-stage discharge	5	1939	1.059	1.067	1.053	1.0625

*Nominal or print dimension. †One location.

What It Costs To Test Formations In California

Is rat-hole drilling too expensive for well evaluation? What's the cheapest way to obtain this information? Here are the answers that California drillers have found from field experience.

by C. R. Ball, Jr. and S. F. Fine

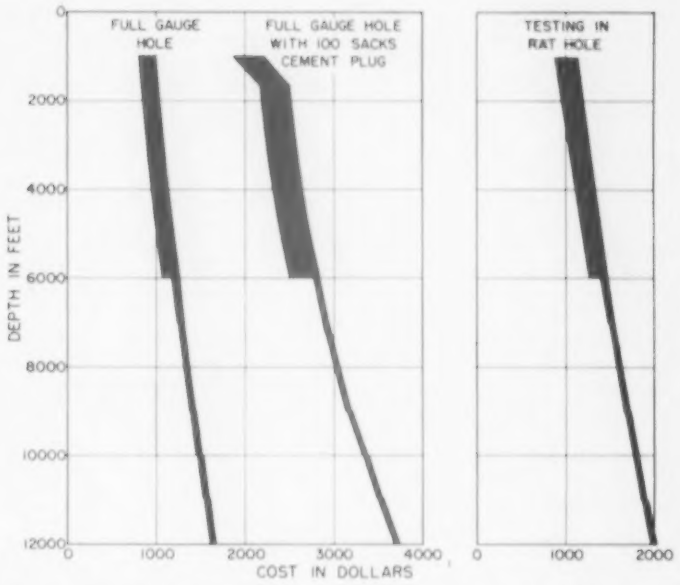


Fig. 1—Approximate cost of 100 ft. open-hole formation test as a function of depth including rig time.

FORMATION testing,[1] or drill-stem testing, is the only way of actually determining the rate at which a formation will produce fluid and the nature of the fluid it will produce without setting casing. It is presently general practice in California to test any zone in a strictly wildcat well which is not pretty well condemned by logs, cores, and other information. The cost of formation testing, including hole conditioning and making up tools, is shown in Fig. 1.

It is desirable to test "on the way in," that is, to test a formation as soon as it is penetrated, for at least three reasons:

1. The sooner the zone is tested the less damage will have been done to the productivity of the formation by the drilling fluid.

2. Methods of testing on the way out are costly.

3. The longer the formation to be tested is exposed to the mud column and to passing drill pipe through it, the more liable it is to be washed out or keyseated, preventing successful sealing off of the packer.

Rat holes pro and con . . . It is also desirable to test in a "rat hole," or reduced-size hole, for at least two reasons:

1. The packer, once it has been pulled from the rat hole after the test, has ample clearance in the full-gage hole above to minimizing sticking and swabbing.

2. Mechanically, a packer has a better chance of holding in a smaller hole than a large one.

From these two basic desires it has been the practice of many operators to explore long intervals in reduced hole as much as several thousand feet generally with the proviso in the program to "open hole as indicated by good drilling practice." Ask 10 good drilling men how much 8½-in. rat hole can be carried below 10⅝-in. full-gage hole consistent with good drilling practice, and the result would probably be 10 different answers. If only "good drilling practice" is considered, the best answer is "none" for several reasons:

1. In most formations the 8½-in. bit will not drill as fast as the 10⅝-in. bit.

2. The smaller bit, having smaller bearings and teeth, will practically never make as much hole per bit as the larger bit. In the sizes mentioned, the price of the small bit is approximately 76 per cent the price of the large bit, so, if it makes 76 per cent as much hole, we break even on bit cost alone. This is only part of the story, however, for with each bit we have a round trip and these cost as much for one bit as for the other. At about 7,500 ft. the cost of the rig time involved in the average round trip actually exceeds the cost of a 10⅝-in. bit.

3. The smaller, limber drill collars generally considered necessary in drilling 8½-in. hole multiply hole-deviation problems where they exist and where a specified maximum drift angle must be adherred to. This usually is combated by drilling with very light weight to straighten the hole, resulting in still further rig costs and bit costs. The limber collars also produce more abrupt changes in drift and direction of the hole, increasing mechanical hazards.

4. It is generally considered that there is an optimum annular rising velocity of the drilling fluids while making hole, that somewhere below this optimum the mud has insufficient velocity to carry the cuttings to the surface, and that somewhere above it the mud tends to wash out or erode the borehole. A figure often heard for this velocity is 175 ft. per minute. If the circulation rate is controlled to maintain this velocity between 4½-in. drill pipe and 10⅝-in. hole, the velocity between 4½-in. drill pipe and 8½-in. hole is 315 ft. per minute. If we carry 3½-in. drill-pipe "tail" in the rat hole, the velocity is reduced to 270 ft. per minute, but we still have 5½ or 5¾-in. drill collars above the 8½-in. bit past which the velocity is 380 to 400 ft. per minute and this in hole we certainly do not want to wash out, for the very reason for drilling the small hole is to provide a seat for a packer. It seems feasible, too, that there would be large, dense cuttings carried in the mud stream at 300 ft. per minute that would cease to rise upon reaching the shoulder where the velocity suddenly dropped to two-thirds that value. This would cause a concentration of cuttings at the shoulder, a definite haz-

This is an abridged version of a paper presented at the spring meeting of the Pacific Coast District, Division of Production, American Petroleum Institute, Los Angeles, April 28-29, under the title "Information vs. Cost in Exploratory Drilling." The authors are with Richfield Oil Corp., Ojai, Calif.

ard when shutting down the pumps and starting out of the hole.

5. Substitution of 1,000 ft. of 3½-in. in. 13.30-lb. I.F. drill pipe and 100 ft. of 2-in. bore drill collars for 1,000 ft. of 4½-in. 16.60-lb. F.H. drill pipe and 100 ft. of 2¾-in.-bore drill collars at the bottom of the string, requires an additional 390-pump horsepower to maintain the optimum velocity in the 10⅝-in. hole. This, of course, would rarely be possible of attainment.

6. Carrying two sizes of drill pipe in the drill string causes a delay each trip in stopping to change elevators and slips.

7. If only the gate-type blowout preventer is used, with rams for closing around 4½-in. drill pipe, the 3½-in. drill pipe is pulled from the hole without benefit of well-control equipment.

Cost of rat holing . . . An evaluation of the cost of rat holing is difficult but Items 1, 2, and 6 can be evaluated for any given set of conditions. Consider first a formation in which a 10⅝-in. bit will drill 200 ft. at 15 ft. per hour, an 8½-in. bit will drill 130 ft. at 14 ft. per hour, and we figure the cost of rat holing from 5,000 to 6,000 ft. with a small rig. The total cost over drilling full-gage figures to be about $950. Consider the same conditions from 11,000 to 12,000 ft. with necessarily a large rig and longer trip time: The cost increased to $1,460. Next, consider a case where the 10⅝-in. bit makes 70 ft. at 5 ft. per hour and 8½-in. bit makes 45 ft. at 3 ft. per hour: At 5,000 to 6,000 ft. the rat hole costs $7,760, and at 11,000 to 12,000 ft. it costs $9,110. These prices do not include the cost of opening hole "consistent with good drilling practice," but this would probably add about 1 to 4 dollars per foot to the cost. These footage and rate figures, incidentally, are based on actual wells.

The disadvantages and costs shown for 8½-in. rat hole could reasonably be expected to be decreased by using 9⅞-in. rat hole below 11 in. full gage. There is still the problem of two separate mud velocities, but there would be no need to carry 3½-in. drill pipe. The 9⅞-in. bit has much bigger teeth and bearings than the 8½-in. bit and should perform better. One big disadvantage of any size rat hole, however, is that when a show is encountered after rat holing ahead several hundred or a few thousand feet, it often costs more to open the hole than it does to actually make the test. In one instance on record the cost of opening a long rat hole in hard formations took much longer than it could reasonably be expected to take to test in full gage, stick the tools, back off, sidetrack, and make some new hole.

From all these things it would seem that we should settle upon a program to keep rat holing to a minimum. The obvious way to do this, in strictly exploratory holes, is not to rat hole at all except upon evidence of shows. The tools we mentioned previously which give information as the hole is being drilled, are drill-cuttings inspection, rate-of-penetration indicator, and combustible gas detector. To evaluate the cost of these services Table 1 has been prepared using the examples previously cited for cost of rat holing.

In the column showing the cost of these devices there is included $25 per day for a geologist since the intelligent use of these services would require the close attention of a geologist.

The column entitled "mud logger" shows the cost of a commercial mud-logging trailer for the time required to drill this same interval. Although this service is expensive, it is shown here that it is far less expensive than rat holing. This service provides 24-hour inspection of drill cuttings for lithology and oil and gas content, combustible gas detector on the mud stream, fluorescent-light inspection of the mud stream for oil shows, rate-of-penetration indicator and generally some core-analysis service.[15] Current asking price of this service is about $145 per day with discounts after 30 days of continuous service.

In the table the cost shown for rat holing doesn't include any cost for gathering information as drilling progresses, yet it must be done while rat holing, too. If a show is passed up on the rat hole, leaving no bottom on which to set the test tail, we are in little better shape than if the same show had been missed in full-gage hole. Therefore, the cost shown for rat holing is actually less than it should be and yet it far exceeds the other costs shown.

Testing . . . It is presumed that upon evidence of shows by the services mentioned, a core would be taken in reduced hole. This should provide enough information to decide upon penetrating enough deeper to log and possibly test, or drilling ahead full gage. Yet, to be practical, it must be realized that some shows will be penetrated too far with the full-gage bit before they are detected to allow testing in rat hole. The disadvantages of testing in full-gage hole have been greatly reduced in the past year or two due to the development of improved sidewall packers. It is now possible to run packers 1 in. in diameter smaller than the hole in which they are to be set and obtain satisfactory packoffs. Many tests have been run recently in full-gage hole with no more troubles than were experienced previously in rat holes.

Drill-stem-test results . . . All of this discussion on formation testing has dealt with the mechanics and economics of testing with a sidewall packer. However, it is well known that many drill-stem tests are failures and that some zones have not been successfully tested in this manner after several attempts. All of the formation tests conducted by a testing company in the Ventura-Santa Paula area were compiled for a recent 4-month period. These tests ranged in depth from 400 to 15,000 ft. under many conditions. For this period the average was 82 per cent successful tests and the 18 per cent of failures consisted of 10 per cent due to packer failure, 3 per cent due to plugging of the tester, 3 per cent due to drill-pipe failure, and one tester was stuck and left in the hole accounting for the other 2 per cent. Of the 18 per cent failures, 13 per cent were successfully retested in the same interval, leaving only 5.7 per cent of the intervals untested by open-hole testing. One of these was successfully retested in sidetracked hole and one was tested by setting a string of casing. On one, no retest was attempted.

For those intervals in which the open-hole test fails the first run, the interval is usually retested with the packers set at slightly different depths or, if only one packer has been used in the first test, perhaps two may be run for the second. If this fails and the test is in rat hole, the hole can be opened to a larger size and retested. For those few intervals in which open-hole testing fails conclusively the test will usually be deferred until total depth has been reached and the intervals tested on the way out, for two reasons:

1. Other methods of testing usually

TABLE 1—COST OF 1,000 FT. OF RAT HOLE VS. 1,000 FT. FULL GAGE AND INFORMATION TOOLS SHOWN

		10⅝-in. full-gage hole		
Example—	8½-in. rat hole cost	Drill cuttings rate-of-penetration gas-indicator cost	Mud-logger cost
10⅝-in. bit—200 ft. at 15 ft./hour, 5,000- 6,000 ft.	$ 950	$190	$ 530
8½-in. bit—130 ft. at 14 ft./hour, 11,000-12,000 ft.	1,460	225	610
10⅝-in. bit— 70 ft. at 5 ft./hour, 5,000- 6,000 ft.	7,760	555	1,580
8½-in. bit— 45 ft. at 3 ft./hour, 11,000-12,000 ft.	9,110	640	1,810

involve restricting the size of the borehole by stub liner or casing.

2. Other methods of testing are quite costly. If commercial production is obtained deeper, the test can be deferred and attempted in a subsequent development well.

A method of testing either on the way in or on the way out involves those formations which are drilled through without being detected and are found up the hole by logging or sidewall sampling at a lower depth. These zones can be tested by using the straddle tester. This is a recently developed tool which has a set of expanding spurs below the lower of two packers. The two packers are spaced to straddle the desired interval. The approximate cost of this tool is $250 more than for regular formation testing. The percentage of success for this tool in California has been around 50 per cent. There is an increased hazard of leaving this tool in the hole, due to the fact that any sand which enters with the formation fluid can settle out on top of the bottom packer. Out of more than 30 runs in California only one tool has been left in the hole and it was due to this cause. In this case the pipe was backed off below the top packer and the fish was recovered after washing over down to the top of the bottom packer.

For those intervals in which all of the open-hole testing methods fail there are these methods of testing on the way out:

1. Plug and test in open hole: This method involves the placing of a cement plug below the interval to be tested both to isolate the interval from the hole below and to form a bottom on which to set the test tail. Otherwise, the procedure is the same as for regular open-hole testing. The method has all the disadvantages previously listed for testing on the way out, plus a few all its own. The cement plug or the mud-soaked formation around it, or both, are sometimes soft and allow the test tail to slip down the hole, minimizing chances of a successful test, and increasing the chances of sticking the tester. The plug is also liable to leak fluid from below, completely confusing the results of the test. There is no way to tell whether the fluid recovered in the test comes from above or below the cement plug.

2. Plug and test in stub liner: This consists of cementing a joint or two of casing above the interval to be tested and setting the packer in this casing. This eliminates two of the disadvantages of the method above, in that the packer seat is very good and a hookwall packer may be used eliminating the hazard of setting test tail on a plug. It is about equal in price to the method above, except that cost of casing must be added.

3. Plug, redrill, and test in open hole: This method eliminates all of the disadvantages stated for the previous methods, except cost. It enables testing in a clean, fresh borehole with a solid bottom. It costs as much as the methods above, plus the cost of sidetracking and making new hole. This cost is subject to so many variables that no general cost curve can be constructed but should be several thousand dollars.

4. Cement casing: This, of course, amounts to putting the well on production. When there are several zones to be tested, the price per zone may be somewhat less than for one zone, but in this case we incur the cost of perforating, a healthy sum, and probably a few squeeze jobs. Before leaving a zone untested due to this cost, however, this question should be considered: Is there sufficient doubt of the productive ability of this (or these) interval(s) to cause the drilling of another well at a later date?" If there is sufficient doubt, the cost of casing will usually look pretty small compared to the cost of drilling another well.

Other problems . . . This fairly well covers the testing techniques in general use in California and gives an idea of their direct costs. Yet, in addition to this they affect other costs in drilling the well. Two very costly problems encountered in drilling a hole into the earth are sloughing formations and keyseating. The probability of developing a keyseat is increased with each round trip made with each extra hour of drilling and with each sharp bend in the hole. Excessive rat holing and coring certainly add to this danger.

Again, those methods which add significantly to rig time add greatly to chances of sloughing. Also, the practice of some geological departments in restricting the type of mud used in exploratory holes to one which gives good electric logs is a foolish one. The intelligent selection of the types of logs to be run in the mud that gives the best hole conditions will usually result in good quantitative analysis and lithological information in all conductive muds.

In extreme sloughing problems the use of oil-base mud should be considered. While this reduces the ability to spot shows as they occur and is costly, it provides a fluid with which holes have been successfully drilled under the most adverse conditions. Conventional cores are little affected by this mud. With the use of the proper electric and radioactivity logging devices lithological information is good. Quantitative estimates of saturations can be made from these logs with only one added assumption, the resistivity of the formation water, which in many cases can be reasonably estimated.

Conclusions

To drill exploratory holes in the most economical manner, fullest use must be made of those information-gathering techniques which obtain information as drilling progresses, causing neither slowdown nor shutdown of drilling operations. The rather complicated practice of exploring in long rat-hole intervals, in particular, appears in analysis to be extremely costly and time consuming and recent improvements in testing equipment render it impractical. All operations which increase drilling time and the number of round trips increase drilling hazards as well as direct costs. When problems of hole sloughing are likely to occur, the geological information program should be geared to those drilling techniques which allow the most rapid and efficient penetration to the total depth of the well.

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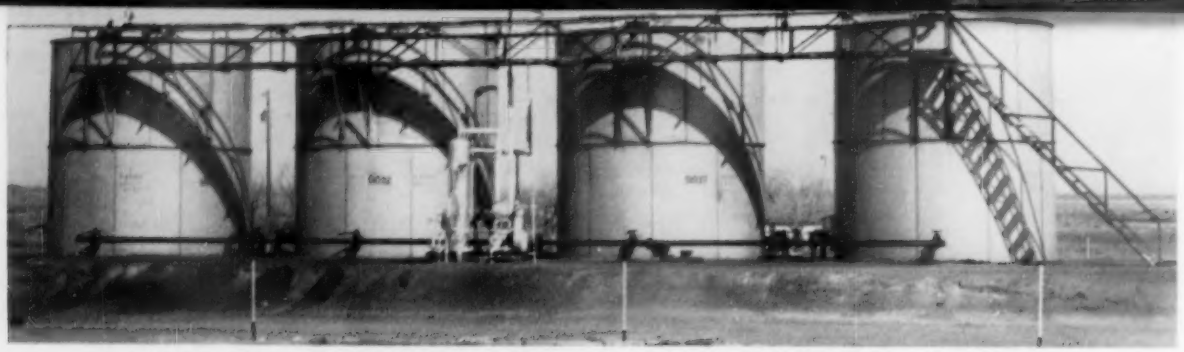


VAPOR-RECOVERY INSTALLATION of Superior Oil Co. in Diamond M field of West Texas. Fig. 1.

Vapor Recovery Has Quick Payout

by Ed McGhee
District Editor

SUPERIOR OIL CO. has installed vapor-recovery systems on three of its tank batteries in Diamond M field of West Texas. These units gather the vapors off 41° to 45° A.P.I. crude which has been staged through separators, volume-type heaters, and into the stock tanks. A positive pressure of 0.4 in. of water is held on the tanks. This prevents air intake and maintains the crude-oil gravity. The recovered vapors, when commingled with the casing-head gas off the separators, enrich the stream to a higher liquefiable content. Since the sales value of the gas goes up with content, Superior is getting more revenue from gas sales.

A typical tank battery with vapor-recovery facilities is shown in Fig. 1.

The first unit installed cost $3,266. During the first year of operation, the vapors recovered by this unit raised the average test content of the sales gas from 1.88 gal. per M.c.f. to 2.82. The operator's investment was fully recovered at the end of that year. Installation costs on the next two units were reduced to $2,886 each. In each case, these costs would have been slightly less had the lease tanks been welded rather than bolted. To make the bolted tanks vapor tight, it was necessary to rework the seams.

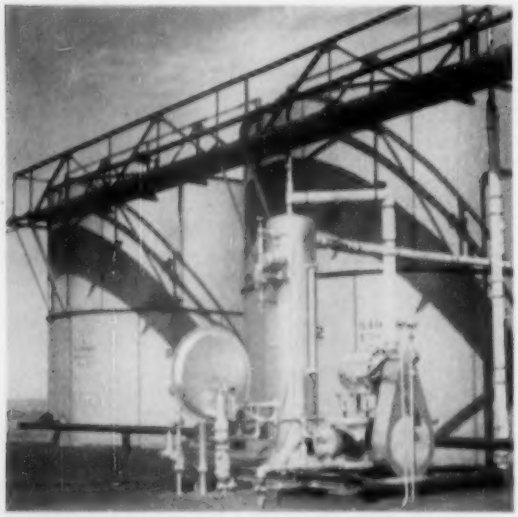
Operation of the vapor-recovery systems is simple, automatic, and free from unusual maintenance troubles. The crankcase oil in the wet vapor compressor must be changed periodically and bottoms must be drained off the suction scrubber occasionally. Other than these two measures, only routine inspection is necessary.

The equipment . . . Figs. 2 and 3 show the principal parts of the vapor-recovery equipment. These are:

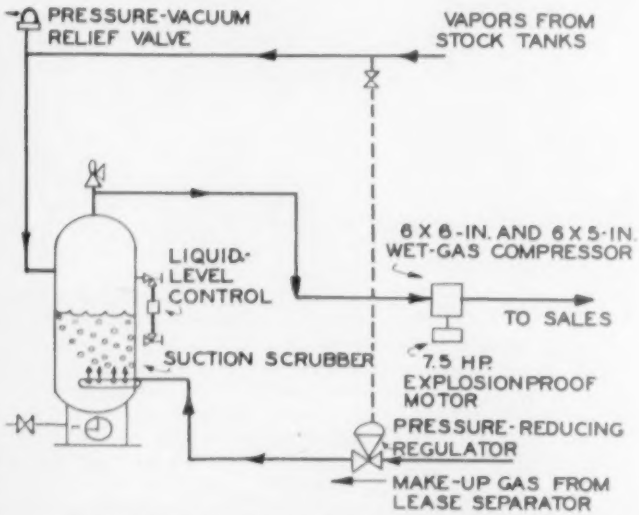
1. The existing steel-bolted tanks sealed to vapors.
2. Vapor lines from the tanks.
3. A suction scrubber.
4. An electrically driven 6 by 6-in. and 6 by 5-in. compressor.
5. A pressure-reducing regulator for makeup gas.
6. A pressure-vacuum relief valve.

Liquid level in the suction scrubber controls the current to the compressor motor.

Continuous operation . . . As Superior's systems are installed, the compressor has a steady load regardless of the vapor supply from the tanks. If there is too much vapor on the tanks, the pressure-relief valve vents some of it to atmosphere. If vapor supply from the tanks is less than the capacity of the compressor, the pressure-reducing regulator injects gas from the lease separator. Moreover, as Fig. 3 shows, this makeup gas strips out the hydrocarbon portion of the scrubber liquid. Thus, there is no appreciable loss of condensable vapors.

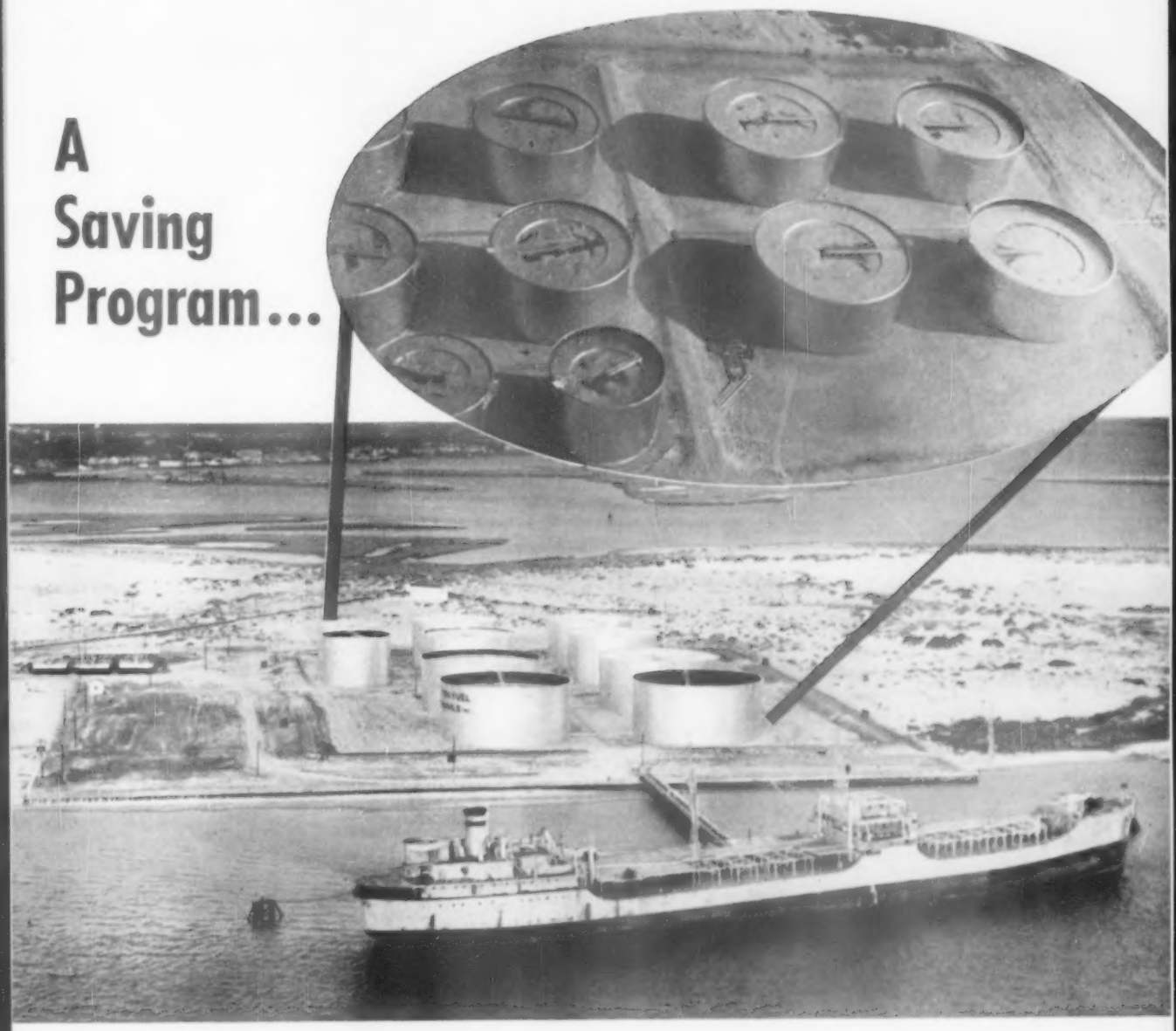


SUCTION SCRUBBER and electrically driven compressor setup on one of Superior's installations. Fig. 2.



SCHEMATIC FLOW DIAGRAM for typical Superior recovery system. Gager makes manual drawoff from the scrubber. Fig. 3.

A Saving Program...



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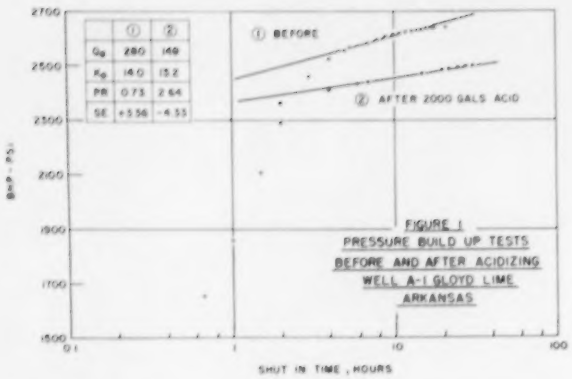


FIGURE 1
PRESSURE BUILD UP TESTS
BEFORE AND AFTER ACIDIZING
WELL A-1 GLOYD LIME
ARKANSAS

	①	②
Q_g	280	140
K_g	14.0	15.2
PR	0.73	2.64
SE	+5.56	-4.55

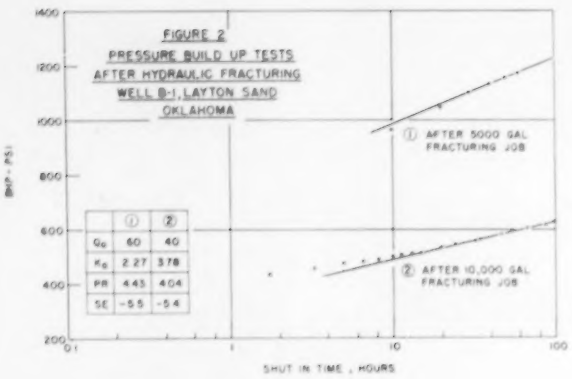


FIGURE 2
PRESSURE BUILD UP TESTS
AFTER HYDRAULIC FRACTURING
WELL B-1, LAYTON SAND
OKLAHOMA

	①	②
Q_g	60	40
K_g	2.27	378
PR	4.43	4.04
SE	-5.5	-5.4

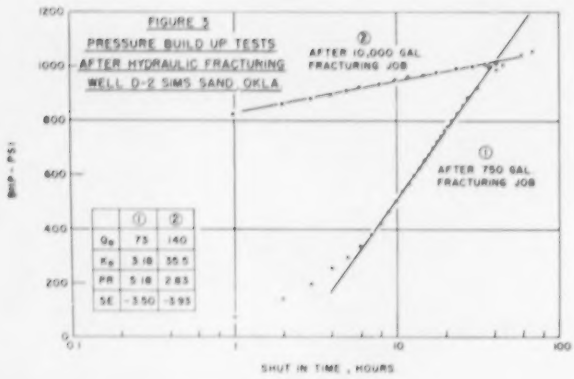


FIGURE 3
PRESSURE BUILD UP TESTS
AFTER HYDRAULIC FRACTURING
WELL D-2 SIMS SAND, OKLA

	①	②
Q_g	73	140
K_g	3.18	35.5
PR	5.18	2.83
SE	-3.50	-3.93

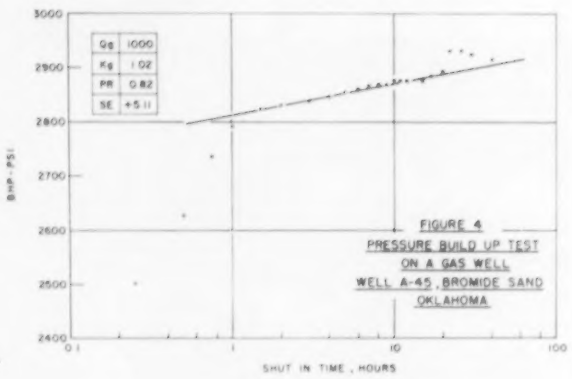


FIGURE 4
PRESSURE BUILD UP TEST
ON A GAS WELL
WELL A-45, BROMIDE SAND
OKLAHOMA

Q_g	1000
K_g	1.02
PR	0.82
SE	+5.11

How Good Is That Well Completion?

The efficiency of well-completion methods can be readily evaluated by pressure-buildup tests. Procedures for taking these tests and a simple method of computing productivity ratios and skin effects are given here.

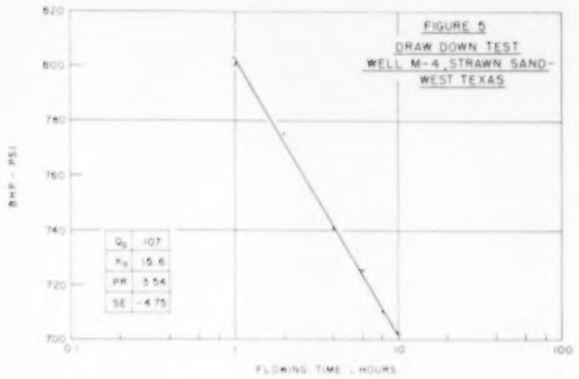
by C. L. Wilson, R. V. Smith, G. E. Hendrickson, and J. D. Stafford

IN recent years, engineers have realized that the pressure-buildup method of testing oil wells provides the best evaluation of the completion of wells. This method which is in common use has gained preference over the older method such as productive-index studies and potentials. Numerous papers[1-12] have been published on pressure-buildup behavior which include actual tests illustrating certain procedures and completion methods. However, statistical analyses of well-completion techniques as evaluated by pressure-buildup tests have not been published. A large number of pressure-buildup tests have been collected by the A.P.I. Mid-Continent Study Committee on Well Completions to determine by statistical methods the effect of different drilling and completion procedures on the flow capacity of the area immediately surrounding the well bore.

Authors are with Sinclair Oil & Gas Co., Tulsa, Phillips Petroleum Co., Bartlesville, Okla., Cities Service Oil Co., Bartlesville, and Atlantic Refining Co., Tulsa, respectively. From paper presented at spring meeting, Mid-Continent A.P.I. district, Division of Production, Amarillo, 1955, under the title, "Evaluation of Well Completions."

Ever since the first oil well was drilled, evaluation of well completion has been a subject of much discussion. Operators in the early days were quick to apply the "potential" test as a measure of completion efficiency. This method is still in use although there are many factors in the potential other than well completion. Development of subsurface pressure gages and samplers, electric logs, and coring has, one by one, isolated and measured the variables that determine a well's capacity to produce. As potential was modified by such factors as thickness, oil viscosity, and pressure drop, the thinking on well completions shifted from potentials to conditions at the bottom of the well. The taking of productivity indexes became the custom. The next step was to correct the productivity index for thickness and use this value as a measure of well-completion efficiency. In comparing offset wells in the same reservoir this was a fair method, provided the in situ permeability and depletion history were similar; but it was not good for comparing completion methods in different reservoirs or areas.

Technicians worked for many years to develop a method of measuring well completions that would be universally applicable. Such a method must determine the flow capacity of the pay zone



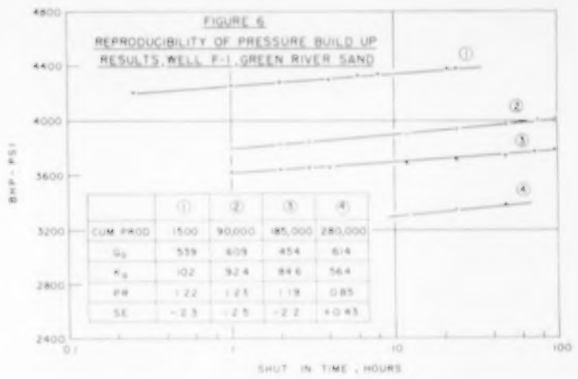
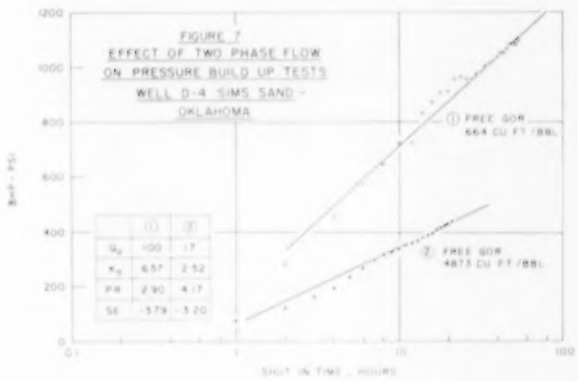


FIGURE 6
REPRODUCIBILITY OF PRESSURE BUILD UP
RESULTS, WELL F-1, GREEN RIVER SAND
BHP - PSI
SHUT IN TIME - HOURS
① ② ③ ④
CUM PROD 1500 90,000 185,000 280,000
Q_0 539 609 454 614
K_0 102 92.4 84.6 56.4
PR 1.22 1.21 1.19 0.85
SE -2.3 -2.5 -2.2 +0.43



as it existed prior to drilling the well, which can be estimated by core analysis, and the flow capacity of the pay zone after drilling the well as indicated by the productivity index.[1] A comparison of the two will give an indication of the quality of well completion. Use of this method has been limited by a lack of cores and the difficulty of applying laboratory measurements to field operations.

Using the radial-flow equation[2] of Darcy's law, the permeability of a formation can be calculated if the radius of drainage, well-bore radius, and other pertinent factors are known. However, most of the pressure drop in a radial system occurs in the vicinity of the well bore; and, therefore, permeabilities obtained from this equation are primarily those of the reservoir rock in this same immediate area.

When comparing permeabilities obtained from two wells which were drilled or completed differently, it is impossible to know with certainty whether the radial-flow equation permeabilities are greater or less than the native or in situ permeabilities of the reservoir rock.

Precautions and Steps in Running Pressure-Buildup Tests

Well equipment needed:

1. Piping manifold, separator, and tank so that production from test well can be measured for at least 24 hours separately from that of other wells on lease.
2. A "swab" valve on christmas tree so that subsurface-pressure gages may be used in flowing well without shutting in the well.
3. Valves on christmas tree and tubing that have openings large enough for passage of subsurface-pressure gages.
4. Gas-measuring equipment for gas-oil-ratio determination.

Production rate requirements:

1. Select a rate which gives a pressure drawdown that can be measured accurately with subsurface-pressure gage.
2. Coordinate test-production rate with proration schedule for the lease.
3. Permit well to flow undisturbed at test rate for a sufficient time to insure stabilization.

Pressure-buildup-test steps:

1. Measure production rate at start of flow to stabilize the well. Measure production rate and gas-oil ratio for at least 24 hours for the test well near the end of the stabilization period. If a test separator is used, operate the test separator at the same pressure as the separator through which the well was producing during stabilization.
2. Measure flowing pressure near the productive horizon in the well.
3. Shut in the well with subsurface-pressure gage at pressure-measuring station.
4. Continue measuring pressure until end of pressure buildup. (Usually, from 24 to 72 hours are required for test.)

Pressure-buildup-data form compiling tests and completion data is shown in Appendix A. This form was used by the subcommittee in obtaining 196 buildup and drawdown tests from 11 contributing companies. It proved to be an entirely satisfactory and simple means of compiling the test data for calculations and analyses. To determine slope and pressure at 1 hour, the buildup data were plotted on three-cycle semilogarithmic paper with shut-in time in hours on the logarithmic scale and pressure in pounds per square inch gage on the coordinate scale.

Analyses of Pressure-Buildup Tests

Pressure-buildup equations have been published by Miller et al.,[4] Horner,[5] Van Everdingen,[10] and Hurst[11] for a uniform formation containing a slightly compressible liquid. However, calculations seem to indicate that in most cases the buildup equations are also applicable for gas wells and wells having two-phase flow.

Productivity ratio is defined as the ratio of actual productivity of the well to the productivity that would exist if the permeability in the immediate vicinity of the well were the same as that in the majority of the drainage area. Productivity ratios greater than 1.0 indicate that the permeability in the immediate vicinity of the well bore is greater than the permeability away from the well. The effective drainage radius must be estimated and the well must be producing at a stabilized rate long enough so that the logarithm of the ratio of drainage to well radius is practically constant. Many methods[2,15] of obtaining the true reservoir static pressure at the drainage radius have been proposed, but none seems to be entirely satisfactory in all instances.

The productivity ratios are not seriously affected by the use of the several

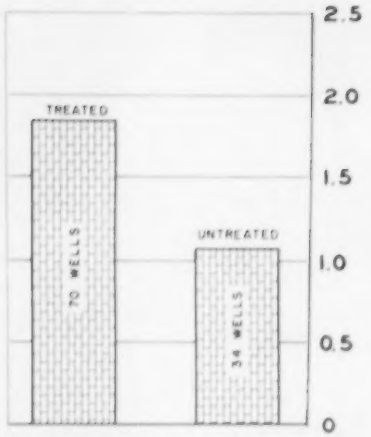


Fig. 8—Productivity ratio in treated and untreated sand wells.

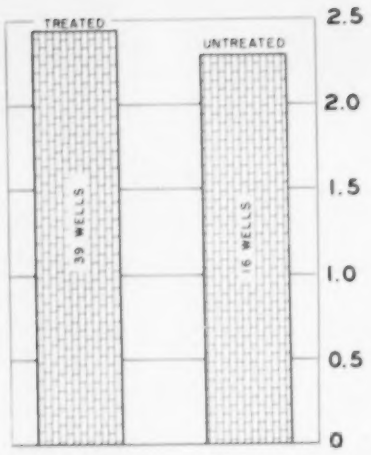


Fig. 9—Productivity ratio in treated and untreated lime wells.

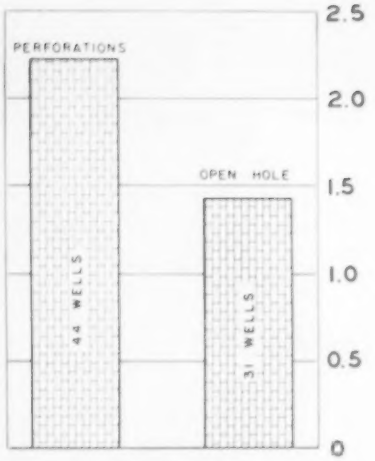


Fig. 10—Productivity ratio vs. perforations or open holes in treated sand wells.

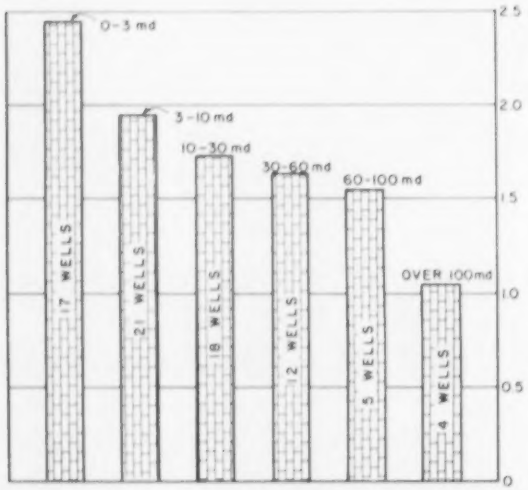


Fig. 11—Productivity ratio vs. permeability in treated sand wells.

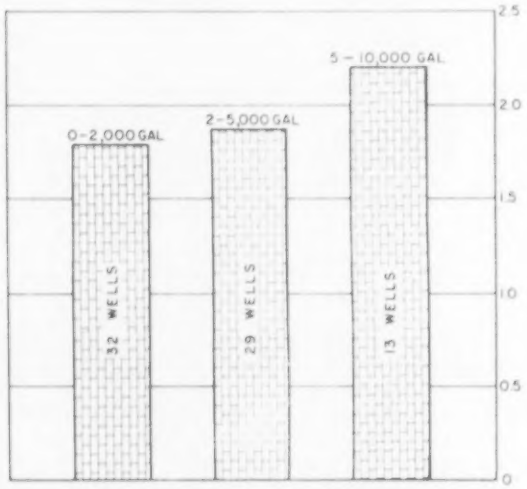


Fig. 12—Productivity ratio vs. size of fracture treatment in sand wells.

methods of obtaining static pressure. In tight formations there may be considerable difference in the fully builtup pressure calculations; however, the drawdown will be large, which minimizes the effect of the static pressure on the productivity ratio. On the other hand, the fully builtup pressure in a highly permeable formation with a small drawdown can be estimated with a great deal of accuracy.

Skin effect is another measure of the restriction to flow in the vicinity of the well bore. A positive value indicates a restriction and a negative value indicates that the skin on the formation has been removed and the effective well radius has been increased. Two of the desirable features of the skin-effect formula are: (1) an estimate of the fully builtup pressure is not required; and (2) the drainage radius need not be determined. On the other hand, porosity, thickness, and compressibility must be known although their effect is somewhat dampened by their being grouped in a logarithmic term.

A comparison between the skin effect and the corresponding productivity ratio for all the tests is shown in Fig. 13. Although the points show considerable scatter about the dashed lines in the figure, there is a definite trend of agreement between the productivity ratio and the skin effect. The disagreement between the two factors reflect the errors in the estimation of final buildup pressure, radius of drainage, radius of the well bore, porosity, and other components of the equations used to calculate the factors.

Basic Equations

The buildup and flow equations as they appear in the literature have been rearranged to give the following (units are in common oil-field terms as shown by the nomenclature):

1. Drainage area permeability

(a) Effective permeability to oil:

$$K_o = \frac{162.5\, Q_o\, \mu_o\, \beta}{mh}$$

(b) Effective permeability to gas:

$$K_g = \frac{815\, Q_g\, \mu_g\, TZ}{mhP}$$

2. Productivity ratio

(a) PR for oil:

$$PR = \frac{2\,(m)\,(\log r_e / r_w)}{P_e - P_w}$$

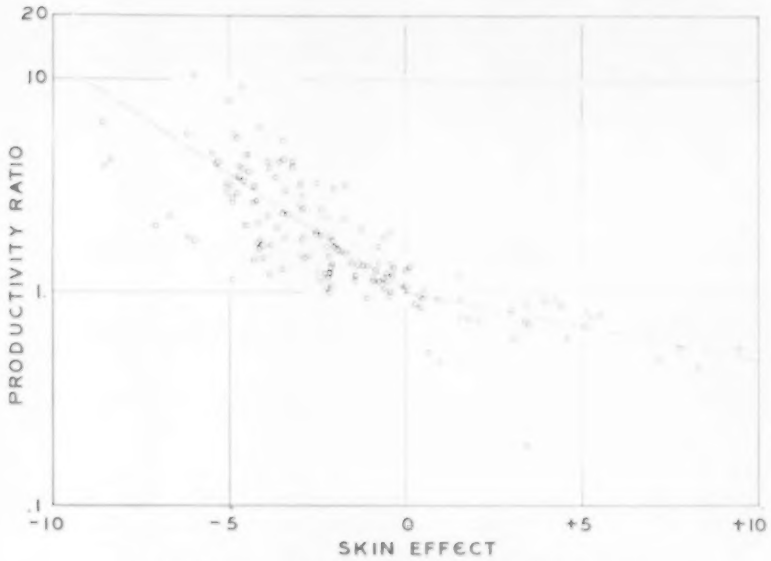


Fig. 13—Comparison between productivity ratio and skin effect.

(b) PR for gas:

$$PR = \frac{4\,(m)\,(\log r_e/r_w)\,(P)}{P_e^2 - P_w^2}$$

3. Skin effect

(a) SE for oil:

$$SE = \frac{1.151\,(P_{1\,hr} - P_w)}{m} - (1.151)\log\left[\frac{Q_o\,\beta}{(10.4)\,mh\,\phi\,C\,r_w^2}\right]$$

(b) SE for gas:

$$SE = \frac{1.151\,(P_{1\,hr} - P_w)}{m} - (1.151)\log\left[\frac{Q_g\,TZ}{(2.07)\,mh\,\phi\,r_w^2}\right]$$

Nomenclature

β = formation volume factor, volume of one unit of residual oil and its dissolved gas at reservoir conditions.
μ_o = viscosity reservoir oil, cp.
μ_g = viscosity of gas, cp.
P = reservoir pressure, psia.
P_e = pressure at effective drainage radius, psia.
P_w = pressure at well bore, psia.
$P_{1\,hr}$ = pressure at 1 hour shut-in time on straight-line portion of buildup curve with slope m.
r_e = effective radius of drainage, ft.
r_w = radius of well bore, ft.
h = thickness of effective pay section, ft.
Q_o = oil rate of flow, bbl. stock-tank oil per day.
Q_g = gas rate of flow, 1,000 cu. ft. per day.
ϕ = porosity, fraction of bulk volume.
C = compressibility, volume per volume per psi.
K_o = effective permeability to oil, md.
K_g = effective permeability to gas, md.
m = slope of straight-line portion of buildup curve in psi. per cycle or

$$m = \frac{P_2 - P_1}{\log\,(t_2/t_1)}$$

Log is to the base 10.

CASE HISTORIES

The following pressure buildup tests are representative of the many calculations and analyses which were made for this report. Each example selected illustrates the application of the well-completion evaluation method to a particular problem.

Before and After Acidizing

Well A-1, Miller County, Arkansas, was initially completed naturally through perforations in the Gloyd lime. Curve 1 in Fig. 1 shows a bottom-hole pressure-buildup test which was run after a cumulative production of 1,625 bbl. of oil. Curve 2 in Fig. 1 shows the buildup test on the same well after acidizing with 2,000 gal.

● Permeability to oil away from the well bore was 14.0 before and 13.2 md. after acid, indicating the treatment did not affect the formation for any distance from the well. The productivity ratio was increased from 0.73 to 2.64 and the skin effect from +3.36 to —4.33. This is an increase in capacity of about 300 per cent—a good example of the effectiveness of acid treatment.

After Hydraulic Fracturing

The effect of hydraulic fracturing on the flow capacity of a well is shown in Figs. 2 and 3. Pressure-buildup tests after 5,000 and 10,000-gal. fracture treatments are plotted in Fig. 2.

● Results of these tests indicate similar productivity ratios and negative skin effects, but the effective permeability to oil over the drainage area was increased 70 per cent by the second fracture treatment.

● A much larger increase in the drainage area permeability by fracture treatment is shown by tests on Well D-2 in Fig. 3. Curve 1 is the buildup curve after 750-gal. fracture treatment and indicates an effective permeability to oil of 3.2 md.; Curve 2 after a 10,000-gal. treatment shows a permeability equivalent to 35.5 md. or an increase of over 1,000 per cent in drainage-area flow capacity. (The spacing in this area was 10 acres.) Productivity ratios and skin effects in both instances indicate no damage to the formation in the immediate well vicinity. These two examples show that economic benefits can result from fracture treatments on wells with no skin effect by increasing the flow capacity of the formation.

Gas Well

The pressure-buildup equations apply to gas wells, provided the pressure drop involved is not excessive. Fig. 4 shows a pressure buildup test on gas well A-45 in Oklahoma.

● The well was treated through perforations with a small-volume fracture treatment, which was not entirely successful in removing the skin effect.

Drawdown Test

The behavior of a well during a pressure drawdown test should obey similar laws to those that govern pressure buildup.[16] A drawdown test is plotted in Fig. 5 on Well M-4, a Strawn sand well in West Texas which was completed through perforations.

● The drawdown test reveals the capacity of the well was not impaired by the drilling or completion method.

Reproducibility of Results

Results of pressure-buildup tests can be reproduced over long periods of time as evidenced by Fig. 6. Well F-1 was acidized with 1,000 gal. in open hole after completion in the Green River formation of Utah which has natural fractures.

● Tests after cumulative production

of 1,500, 90,000, 185,000, and 280,000 bbl. of oil show similar productivity ratios of 1.22, 1.23, 1.19, and 0.85, respectively. Pressures were above the bubble point in all tests.

Apparently pressure-buildup equations apply to two-phase flow provided the compressibility of the composite fluid is small and constant. The example in Fig. 7 gives two tests on the same well where the gas saturation increased between tests. In the first test the gas-oil ratio was 833 and had increased to 4,880 cu. ft. per bbl. on the second test.

● The productivity ratios and skin effects were essentially the same in both tests, while the effective permeability to oil decreased from 6.6 to 2.5 md.

Statistical Analysis

A treated sand well is one which has been fractured by one of the hydraulic-fracturing processes. No distinction is made between the various types of treatment except in Fig. 12 where the size of treatment is considered.

Fig. 8 shows productivity ratios on all sand wells for which buildup data were available. The fact that the untreated wells have an average productivity ratio approaching unity should not be interpreted to mean that none of these wells was damaged upon completion. Data show that Pennsylvanian sand wells of North Texas have productivity ratios of 0.57 before treatment, and even after treatment do not respond as well as most wells. Fig. 10 shows that treatment through perforations has been more successful than treatment in open hole. Fig. 11 shows productivity ratio and the corresponding permeability for treated wells. Productivity ratios decrease with increasing permeability and approach unity at 100 md.

Sufficient data are not available to make a more extensive analysis of untreated sand wells. It is hoped that this presentation will encourage operators to gather more of this type of data.

Fig. 9 shows that as an average, untreated lime wells have a productivity ratio greater than unity. It is believed that low productivity ratios were not found in lime wells since the poor wells were probably treated with acid. Productivity ratios greater than unity in many untreated wells might be caused by:

1. Fractures induced while drilling.
2. The well bore being located in an area of better than average fracture development.
3. Vugs cut by the well having the effect of increasing the well-bore radius.

TABLE 1—NUMBER OF WELL COMPLETIONS BY CATEGORIES

	Productivity ratio greater than one				Productivity ratio less than one			
	Sands		Limestones		Sands		Limestones	
	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated
Number completions	52	18	36	13	14	14	3	3
Type porosity:								
Fractured matrix	12				1			
Intergranular	40	18	6	2	13	14		1
Vugular			30	11			3	2
Drill-in method:								
Cable tools	11	1		2	1			
Rotary	41	17	36	11	13	14	3	3
Type mud:								
Water base	12	11	36	11	5	10	3	3
Oil emulsion	29	6			9	4		
Oil	11	1		2				
Type treatment:								
Fracture	50		1		12			
Acid	2		35		2		3	
Type completion:								
Open hole	19	3	6	7	5	2	1	
Perforations	33	15	30	6	9	12	2	3

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APPENDIX A
PRESSURE-BUILDUP DATA
A.P.I. WELL-COMPLETION EVALUATION SUBCOMMITTEE

Well No. , Lease , Company

Field , County , State

Producing Formation , Drill-in Method

Hole Diameter , Well Spacing , Type Mud

Kind of Treatment , Vol. Treatment

Csg. Seat , P.T.D. , Eff. Sd. Thick. , Porosity

Producing Intervals

Visc. Oil, cp. , Gravity Oil, °A.P.I. , B.H.T., °F. , Gas, Sp. Gr.

Sol. Gas, cu. ft./bbl. , Sat. Press, psig. , F.V.F.

Test Date , Flow Period, hr. , Flowing B.H.P., psig

Prod. Rate, Oil—bbl./day , Water—bbl./day , Gas—M.c.f./day

Cum. prod. Oil—bbl. , Water—bbl. , Gas—M.c.f.

Fluid Compressibility , (Reservoir Conditions at Time of Test)

Shut-in time (hr.)	Pressure (psig.)	Shut-in time (hr.)	Pressure (psig.)

Calculations:

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—10

How Passes in Tube Bundles Affect Performance

ANOTHER important consideration in the design of heat exchangers is the tube-field layout. Most exchangers have the tube fields on a 90° or 60° layout. The 90° field is generally used for fouling services where the shell side must be mechanically cleaned; it provides cleaning lanes between the rows of tubes.

The 60° layout does not have cleaning lanes. But it does have more surface in a given diameter and therefore costs less per square foot. The 60° tube field is generally used for clean service or when chemical cleaning of the shell side is possible.

Q. What's a single pass in tubes and what does it accomplish?

A. The number of shell-side and tube-side passes affects the temperature difference used in computing the required surface. Some floating head exchangers are built with a single pass in their tubes. That is, one of the tube-side nozzles passes through the shell cover and is welded to the floating head. Differential expansion between the shell and tube bundle must be allowed for in some manner. An expansion joint in the pipe, as shown in Fig. 5, or a packed gland, as shown in Fig. 6, can be used.

Introducing a single pass into a tube bundle allows for true countercurrent flow of the shell-side and tube-side fluids. The countercurrent flow utilizes the temperature difference between the fluids most effectively. In spite of this advantage, a single pass in tubes is not common because the quantity of fluid in tubes is seldom large enough to get a good transfer rate with a single pass. Multiple pass in tubes gives a higher velocity and a correspondingly higher transfer rate.

This material is from a paper, "Design Features in Heat Exchangers," by W. E. Glausser and J. A. Cortright, C. F. Braun & Co., Alhambra, Calif. Paper presented at annual meeting, A.S.M.E., New York.

Q. What's the function of a multiple pass in tubes?

A. Multiple-pass provisions in tubes reduce the true countercurrent temperature difference. This reduction is limited to about 20 per cent. The 20 per cent factor applies when the hot fluid is cooled to about the same temperature as the outlet temperature of the cold fluid. A temperature crossover results when the hot fluid is cooled below the outlet temperature of the cold fluid. With multiple pass in tubes, two or more exchangers in series are required to get the temperature crossover. Sometimes the required surface is so small that two exchangers in series are uneconomical. In such cases, an exchanger with a longitudinal baffle in the shell is sometimes used.

Q. What advantage do two-pass shells offer?

A. The long baffle splits the exchanger along its longitudinal axis (Fig. 7). In essence, the two-pass shell is two exchangers in series. There are some problems with a two-pass shell. Some heat passes through the baffle. This heat loss can be kept low by building the long baffle from two plates separated by dead space. Some fluid bypasses around the edge of the long baffle. But this fluid leakage is kept small by a tight seal between the long baffle and the shell. Exchangers with long baffles are not recommended for fouling service where the shell side must be cleaned manually. Two-pass shells are often used for condensers and for final coolers.

Fig. 5—Single-pass in tubes with an expansion bellow.

Fig. 6—Single-pass in tubes with a packed gland.

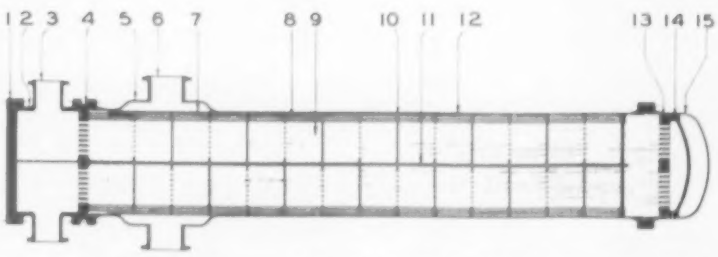

Fig. 7—Cross-section of a two-pass shell with a longitudinal baffle. The numbered parts are: (1) channel cover; (2) channel; (3) channel nozzle; (4) channel tube sheet; (5) annular distributor; (6) shell nozzle; (7) distributor sleeve; (8) tie rods; (9) tubes; (10) segmental crossbaffle; (11) long baffle; (12) shell; (13) floating-head tube sheet; (14) floating head; and (15) shell cover.

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QUESTIONS ON TECHNOLOGY

Cost Index for Hand Tools Explained

by W. L. Nelson
Technical Editor

Q. What are the basic prices (1946) upon which your Cost-imating indexes such as those of April 11, 1955, are based? I am especially interested in the index for hand tools.—M.W.G.

A. Prices mean little unless the type of equipment is clearly understood. Accordingly, the prices disclosed here and also the items of equipment used in the composite hand-tool index are described in Table 1. Actual prices are not as complete as the price indexes, but those that are available are indicated in Table 2.

The hand-tools index carried on the quarterly Cost-imating page in The Oil and Gas Journal (January, April, July, October) is a weighted average of the items shown in Table 2. Yearly values of the Composite Index of Hand Tools have been:

	Hand-tool index (1946 = 100)
1926	84.2
1944	93.0
1945	93.0
1946 basis	100.0
1947	112.0
1948	125.2
1949	134.0
1947-49	123.8
1950	143.2
1951	154.2
1952	155.1
1953	165.4
1954	173.8
December 1954	178.9

More detail can be obtained from the quarterly Cost-imating pages. Monthly indexes of the 22 tool items which compose the composite index can be obtained from the original Bureau of Labor Statistics' publications. Prior to January 1952, the Composite Hand Tool Index consisted of only the 12 items indicated by the footnote of Table 1.

TABLE 1—DESCRIPTION OF HAND TOOLS

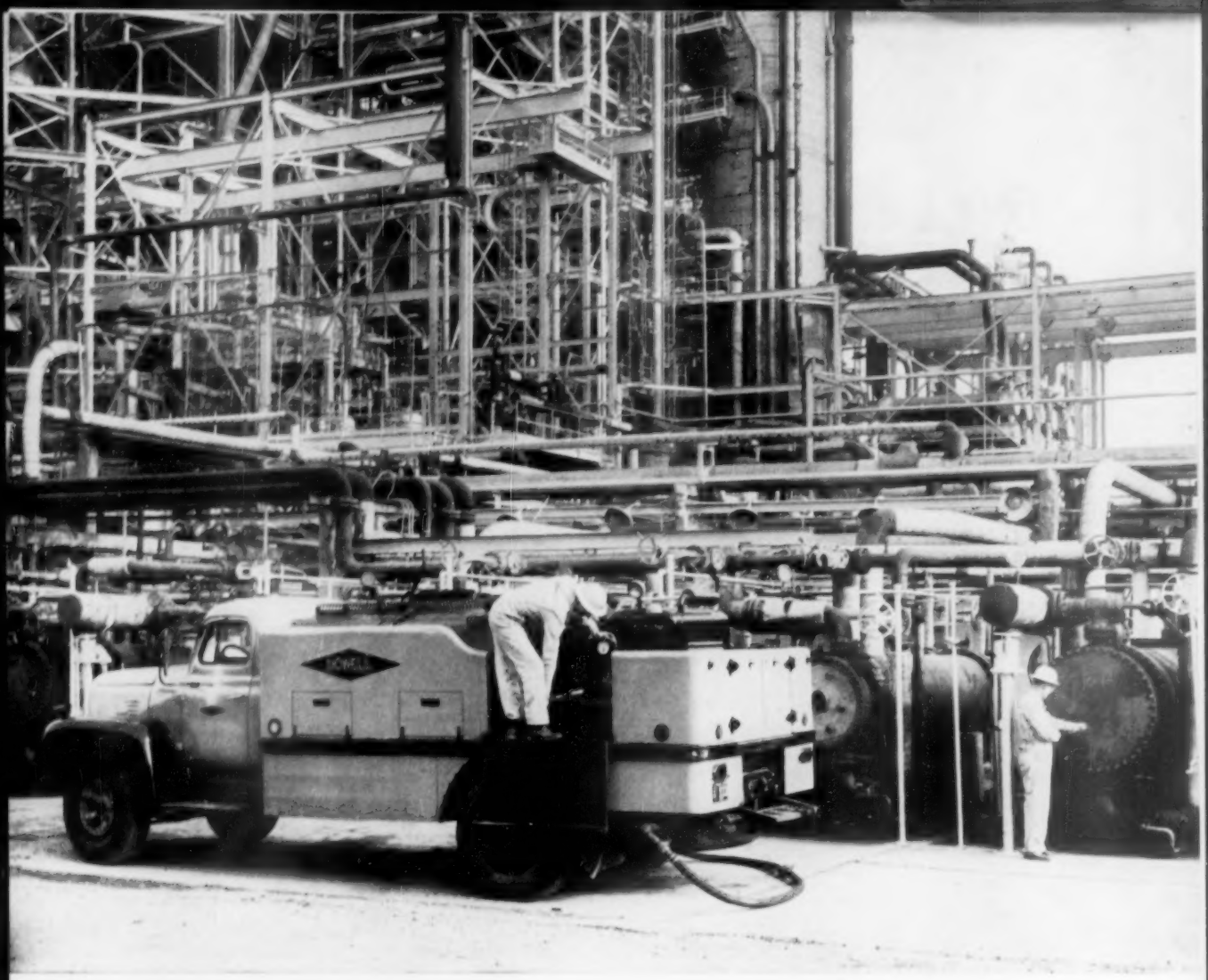
Code*	Identification	Description
10-42- 1	Scythe	Scythe, weed, 26-in., one piece, solid blade.
†10-42- 6	Axe	Axe, single bit, 3½-4½ lb.
10-42-11	Knife	Knife, paper, 50 in. by 5½ in. by ⅝ in.
†10-42-16	Plane	Plane, jack, 14 in. long, 2-in. cutter, adjustable.
†10-42-21	Chisel	Chisel, wood, ¾ in. wide, 3½ in. long, socket butt, beveled blade.
†10-42-26	Bit	Bit, auger, ½ in.
10-42-31	Open-end wrench	Wrench, open-end, engineers', ½-in. and ⅞-in. openings, chrome vanadium steel.
10-42-32	Box wrench	Wrench, box, ½-in. and ⅞-in. openings, chrome vanadium.
10-42-33	Adjustable wrench	Wrench, adjustable, 8 in. long, 1¼-in. capacity, alloy steel.
10-42-34	Stillson	Wrench, stillson type, 14 in. long, 1½-in. capacity, steel handle.
10-42-35	Monkey wrench	Wrench, monkey, 10 in. long, 1¾-in. opening, steel handle.
10-42-41	Screw driver	Screw driver, 6-in.
†10-42-46	Vise	Vise, standard machinist's bench, stationary base.
10-42-51	Pliers	Pliers, 6-in. long nose.
†10-42-56	Shovel	Shovel, long handle, No. 2 size, round point.
†10-42-61	Hammer	Hammer, carpenters', 1 lb.
†10-42-66	Hoe	Hoe, field and garden, 6¼ in.-6⅝ in. wide, 4½-ft. handle, socket pattern.
10-42-71	Trowel	Trowel, brick, 10-11 in. long.
†10-42-76	File	File, flat bastard, 8 in.
10-42-81	Hacksaw blades	Hacksaw blades, hand, 18-4-1 tungsten steel, 12 in. by ½ in. by 0.025 in., 18 teeth.
†10-42-86	Crosscut saw	Saw, crosscut, 6-ft., 2-man.
†10-42-87	Saw	Saw, hand, 26-in.
†420.1	Hatchet	Hatchet.

*Code of Wholesale Price Index of U. S. Department of Labor, Bureau of Labor Statistics. Used after January 1952. †Used in Hand Tool Composite Index until January 1952.

TABLE 2—PRICES* OF HAND TOOLS AND INDEXES FOR NOVEMBER 1954

		Price each		Price index
		1946	Nov. 1954	(1946 = 100)
10-42- 1	Scythe			‡161.0
10-42- 6	Axe	$1.395	$2.700	194.0
†10-42-11	Knife			‡135.0
10-42-16	Plane	2.615	4.167	159.1
10-42-21	Chisel	0.578	0.98	170.0
†10-42-26	Bit	0.938		
†10-42-31	Open-end wrench	‡0.384	0.632	‡165.0
†10-42-32	Box wrench	‡0.444	0.755	‡170.0
†10-42-33	Adjustable wrench			‡151.8
†10-42-34	Stillson	‡1.20	1.523	‡126.8
†10-42-35	Monkey wrench			‡172.0
10-42-41	Screw driver	‡0.266	0.396	‡149.3
†10-42-46	Vise	9.022	22.67	251.5
†10-42-51	Pliers			‡233.2
10-42-56	Shovel	1.355	1.99	147.0
10-42-61	Hammer	0.661	1.612	244.0
†10-42-66	Hoe	0.648	1.33	205.0
10-42-71	Trowel	‡0.974	1.733	‡178.0
†10-42-76	File	0.157	0.346	220.0
†10-42-81	Hand-saw blades	‡3.95	7.04	‡178.0
†10-42-86	Saw (crosscut)	3.80	6.33	166.5
†10-42-87	Saw	2.20	2.98	135.6
10-42	Composite			178.9

*Manufacturer to jobber, dealer or distributor, f.o.b. factory, freight equalized except as noted by "†" (dagger). †Freight allowed but sometimes only on specified large orders. ‡Estimate.



While the cat cracker remained in full operation, DOWELL cleaned six slurry exchangers chemically . . .

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No cat cracker operator wants to see his throughput go down. Neither did this one. Nor could he afford to wait for the annual shutdown to give six slurry exchangers the cleaning they obviously needed *fast*. His solution? Call Dowell to remove the scale deposits with chemicals.

Dowell engineers devised a procedure for cleaning the exchangers *with the cat cracker in full production*. The exchangers were cleaned by Dowell one at a time, while the remaining five units carried the load.

As a result of chemical cleaning, the operator reported a jump in throughput of *900 barrels per day* . . . plus an average increase of 26° in the heat co-efficient of the exchangers.

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VACUUM-FLASH VAPORIZATION—1

Assembling Plant Data for Estimating Vaporization

by G. A. Filak, H. L. Sandlin, and C. J. Stockholm

How do calculation methods compare with plant data for estimating vaporization in vacuum flashing of heavy petroleum fractions?

Flashing at low pressures increases the yield of charge stocks to catalytic units and reduces the volume of less valuable residual fuels. Increased interest in low pressure flashing has promoted development of methods which enable the designer to estimate the quantity of materials that will be vaporized in a flashing chamber.

The best-known methods are those of Nelson and Harvey,[1] Edmister and Pollock,[2] Okamoto and Van Winkle,[3] and Okamoto and Van Winkle-TBP.[4] All four methods may be applied to distillation at pressures below atmospheric. However, low-pressure extrapolation of Edmister and Pollock's correlations is not recommended by their authors.

Plant data . . . The results obtained when using these four calculation methods are not identical. So to compare them with results obtained in commercial practice, several tests were made using conventional plant equipment. In carrying out this plant work, every precaution was observed to keep the experimental error well within the limits of normal fluctuations encountered in routine refinery operations.

1. Vacuum Towers

Three refinery vacuum towers, two of them of identical design, were used in this work. A sketch of these towers is shown in Fig. 1. Towers A and B have an internal diameter of 11 ft. They are equipped with four side strippers and lines for continuous withdrawal of a slop-cut and residual fraction. The bottom section of the tower has a diameter of 5½ ft. Steam is used in this bottom section for removing all light fractions from the residuum before it is withdrawn from the still.

The flashing section of Tower C has a diameter of 12½ ft., and its bottom section has a diameter of 6 ft. The height of the flashing chambers within Towers A and B, and Tower C are 6 ft. and 12 ft., respectively.

Equilibrium conditions . . . The instruments used for measuring the temperatures, pressures, and rate of flow of materials to and from the tower were tested for accuracy before each run was made. Equilibrium conditions within the units were established before each test, and each test consisted of 8 to 12 hours of uniform unit operation. As an additional precaution, the liquid on the first draw-tray above the flash chamber was removed at a rate sufficiently high to prevent overflow, thus minimizing the possibility of overflashing. Maximum variations in temperatures and pressures during the test periods did not exceed ±6° F. and ±10° F. Hg, respectively. Samples from the unit were secured every 3 hours and composited for laboratory analysis.

Authors are with the technical department, refining division, Magnolia Petroleum Co., Beaumont, Tex. Paper presented at second annual joint A.I.Ch.E.-A.C.S. meeting, Sabine area and Texas-Louisiana Gulf chapters, respectively.

2. Charge Stocks

Residuums obtained from atmospheric distillation of four mixed-base and one asphalt-base crude oils were used in order to provide a variety of charge stocks for testing purposes. The data (to be presented in the next installment) show that none of these residuums exhibited abnormal distillation characteristics.

The residuums were flashed at pressures ranging from 35 mm. to 127 mm. Hg absolute and at temperatures ranging from 725° to 753° F. Volumes of materials vaporized in the flashing chambers varied from 42 to 76 volume per cent based on charge. The experimental conditions and other data pertinent to each of the six tests made on the distillation towers will also be summarized in the next installment.

3. Laboratory Distillations

Laboratory data required for calculation purposes were obtained by distilling the residuums charged to the plant units in a 5 l., round-bottom distillation flask having an internal diameter of 22.2 m. Other details of the laboratory distillation apparatus are shown in Fig. 2. The flasks were insulated as shown.

Two liters of oil under test were distilled at 5 mm. Hg pressure and at temperatures not exceeding 650° F. in order to avoid thermal decomposition. Vacuum-distillation temperatures were corrected to atmospheric pressure.[5] The distillate was collected in 5 per cent fractions by volume, and these fractions were tested for gravity, refractive index, and aniline number. The results of these tests will be given in the next installment.

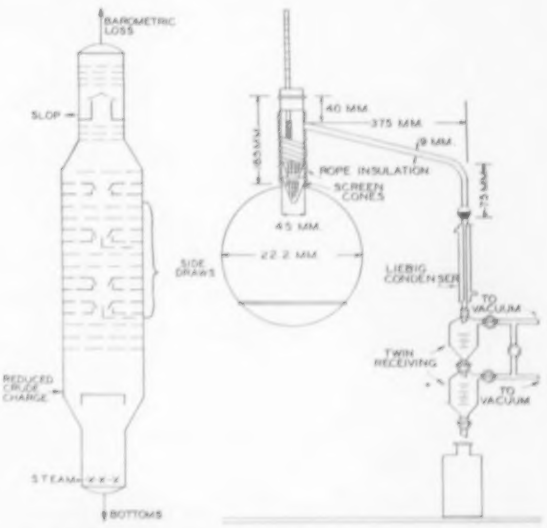

Fig. 1 (left) is sketch of commercial vacuum units used to obtain plant flash data. Fig. 2 (right) shows laboratory distillation equipment used in test.

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Maintaining Slush-Pump Fluid Ends—3

IT is important to select a suitable rubber composition to match the type of mud employed. The piston rubber is most critical.

Clean water provides relatively poor lubrication and cushioning, so that the natural-rubber parts which are generally used with clear water will wear more rapidly than when used with mud.

Water-base muds at normal temperatures and with low abrasive content usually result in good service with natural-rubber parts.

Oil-base muds create a more difficult service problem which must be met with oil-proof synthetics. But even these are often troubled with softening and swelling. Such difficulties are aggravated by low-aniline-point oils. An aniline point of at least 150° F. is recommended for normal drilling. It must be higher than the mud temperature.

Typical rubber failures . . . Failure by extrusion and pinching is characteristic of practically all pump rubber parts. Fig. 3 shows a typical failure which becomes a fatigue-type failure under repeated loading. Rubber, under high pressure, acts much like a fluid and tends to flow or extrude through openings only a few thousandths of an inch wide. When the pressure is relieved, the rubber tends to resume its former shape.

Many repetitions of this stress cycle finally result in pinching off a small section of the rubber, which is then discharged through the opening. Then the original body of rubber must distort an added amount to fill the resulting void and again extrude into the opening. The failure progresses in this manner until a considerable portion of the rubber is lost. Finally, this causes a major failure through the entire rubber body.

Liners

Selection . . . A suitable liner should have a strong ductile body and a thick, hard, abrasion-resisting case in the bore. It is important that the hardening method produce a uniformly hardened surface because even a single soft spot can invite failure. Where severe corrosion is encountered, it is usually economical to employ liners with a supplementary heavy-chrome plate over the hard case. This layer of chrome, being both corrosion and abrasion-resistant, gives considerable initial service in addition to the normal life of the hardened case.

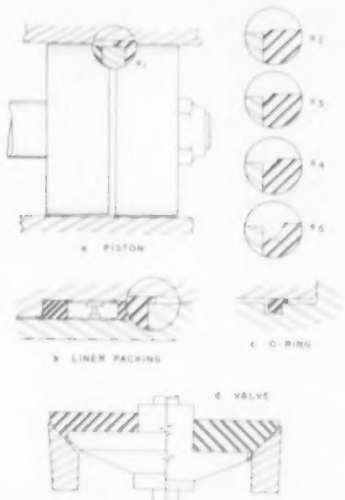


Fig. 3—Typical extrusion failures.

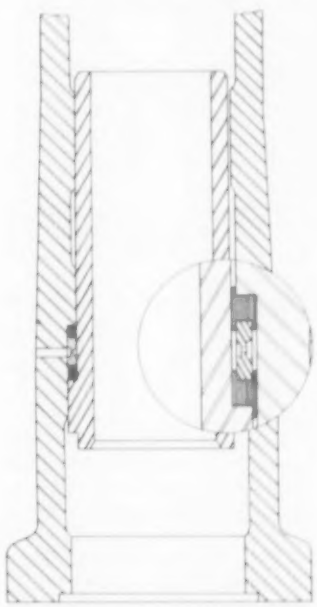


Fig. 4—Packing extrusion due to undersize liner.

Fit . . . A close fit between the pump bore and both the body and the collar of the liner is absolutely necessary for a satisfactory high-pressure packing installation. This fit also assures correct alignment of the liner in the pump. Excessive looseness will cause extrusion failures as shown in Figs. 3b and 4. It will also ultimately require repairing and reboring the water cylinder itself. Obviously, such close fits require both that the liner be of the correct nominal size established by the pump manufacture and that it be carefully finished within close tolerances. The quality of roughly machined or heavily painted liners should be questioned.

Similarly, good piston performance requires a smooth, accurate bore—smooth to minimize piston wear, and accurate to delay extrusion failures as shown in Fig. 3a.

Reworking . . . Worn liners repaired by reboring and either rehardening or installing a sleeve cannot be economical unless they fit the pump like new liners. During the annealing process, preparatory to reboring, liners can be excessively scaled and warped so that the outside diameter cannot be trued up to the correct size. In such cases, both the liner body and the liner collar should be built up at the critical points and then refinished accurately to size.

Storage . . . New liners should be stored in their original packages. Partially used liners should be cleaned free of mud, rust and moisture, thoroughly greased, and protected from physical damage.

This material taken from Tool Pusher's Manual, A.A.O.D.C. Originally prepared by J. V. Mahan, National Supply Co., Pittsburgh.

1 Plastic pipe is first connected to a brass valve at the wellhead. The smaller feeder lines are joined to the 3-in. main line.

2 Then the main oil line is laid along the ditch. The crew can easily handle the pipe without mechanical equipment.

In an oil field where corrosion is a costly headache,

Plastic pipe links crude gathering system

by R. T. Holtz

THE first use of plastic pipe to handle crude oil in a water-flood system took place recently when nearly 2 miles of rigid polyvinyl chloride pipe was installed in Alluwe field, 50 miles northeast of Tulsa. The plastic gathering line joins 20 oil wells to the main 3-in. rigid vinyl line leading to the tank battery. Being immune to galvanic corrosion and highly resistant to both salt water and sour crude oil, the rigid vinyl pipe solves the severe corrosive problems often associated with water-flood operations.

Location . . . The rigid vinyl line was installed on the Davidson Oil Co. lease, Sections 24 and 25-25n-16e in Nowata County. The producing formation is the Bartlesville sand, which occurs in this area at a depth of 500 ft. and has an average thickness of 55 ft. The plastic pipe replaced an equivalent steel-pipe system that had failed within 3 years due to sulfur and salt corrosion. The lease produces 36°-A.P.I. gravity oil.

Author is product engineer, B. F. Goodrich Chemical Co., Cleveland, Ohio.

The pattern on this lease, a five-spot has four injection wells spaced 330 ft. apart with one oil-producing well in the center of the rectangle formed by the input wells. Water for this project is obtained from Lightning Creek and supplemented by salt water produced with the oil. All water is aerated, treated with lime and alum, and filtered before it is injected into the oil sand under a well-head pressure of 600 psi. Reciprocating pumps, operated in tandem, are used on many of the oil wells in Alluwe field.

Piping system . . . Eleven lead-in lines connect the 20 oil wells to the main line bisecting the lease. About 6,100 ft. of 1½-in. and 1,200 ft. of 2-in. rigid vinyl pipe were used in the feeder lines. Another 1,800 ft. of 3-in. vinyl pipe was installed for the main line. Both normal and high-impact rigid vinyl pipe from Quaker Rubber Co. were used in the system.

All plastic fittings were used in the pipe system except for the brass shutoff valves inserted in the feeder lines to cut off any one well without interrupting flow from the remaining wells. These vinyl fittings included couplings, tees, elbows, and reducing couplings. Well head connections were made with a vinyl to metal coupling. The main 3-in. line delivers the crude oil to the separation tank by gravity feed from the top.

Operating pressures in the system range from 40 to 60 psi.—well below the maximum working pressure of the pipe, and temperatures will not exceed ground temperatures except where the pipe is exposed at the wellhead and tank battery. Operating pressures are reduced due to the greater fluid flow of rigid vinyl pipe. At present, the line is carrying 600 to 750 bbl. per day.

Installation . . . A two-man crew installed the rigid vinyl pipeline using slip-sleeve fittings and solvent cement. Though it was their first experience in installing plastic pipe, they had no difficulty in mastering the simple method of joining the rigid vinyl pipe. When one man had cleaned off any dirt or

3 Next, the ends of the pipe and couplings are wiped clean and solvent cement is brushed onto the joining surfaces.

4 Now the pipe and couplings are pushed together to obtain a snug fit. The joint is made up in less than a minute.

5 When all the joints are made, the line is laid into the ditch by one man.

6 End of the line is the separation tank. The plastic pipe takes the place of steel pipe to bring in sour crude oil and salt water from the wells.

moisture from the coupling and ends of the pipe, the other workman brushed solvent cement onto all joining surfaces. The pipe and fitting were quickly assembled and pushed together to obtain a snug fit. The entire operation took less than 1 minute to join 3-in. pipe with a slip-sleeve coupling.

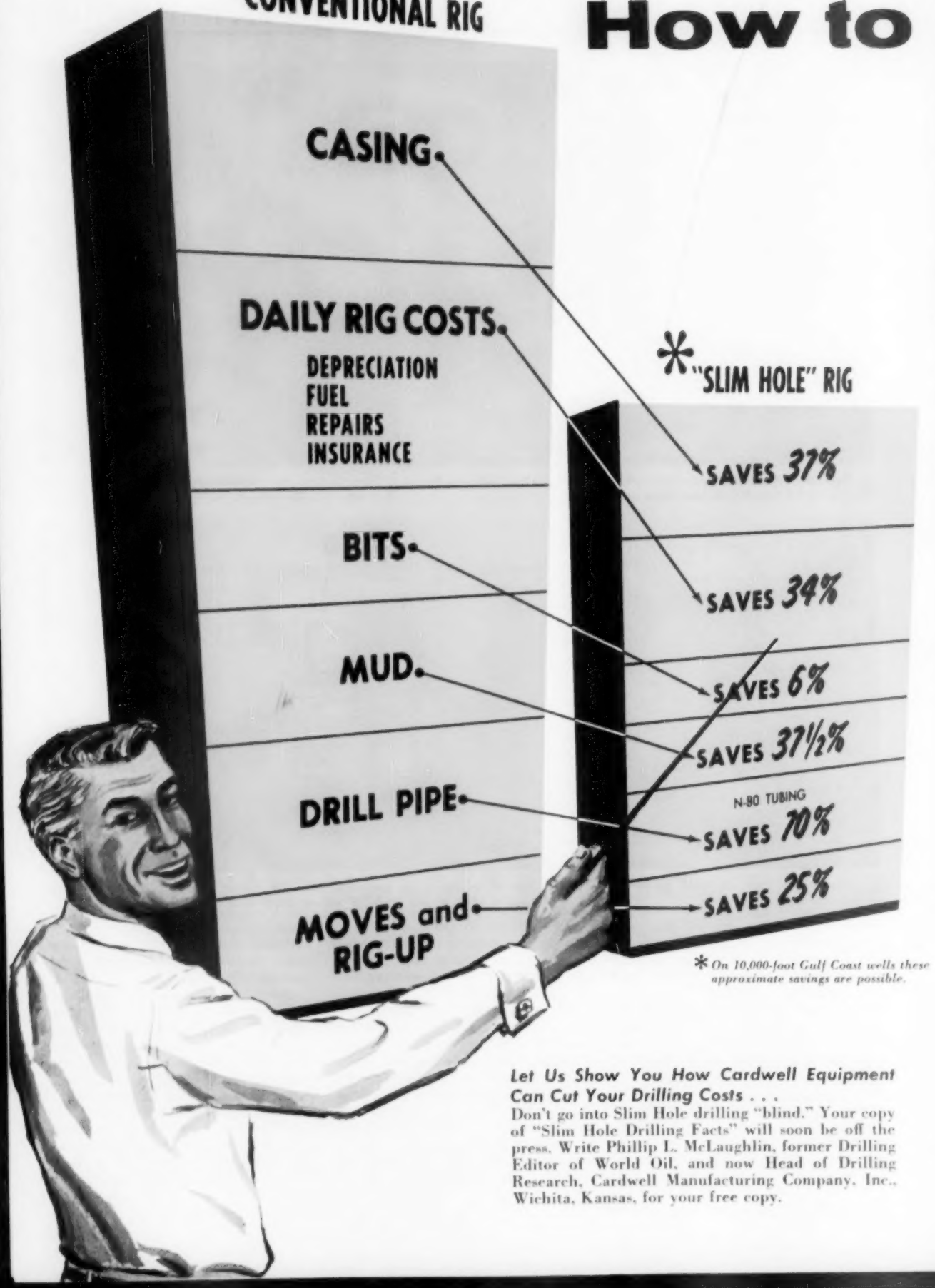
This two-man crew joined 640 ft. of 3-in. rigid vinyl pipe in 1 hour. It would require approximately 10 hours to join a similar length of cement-lined pipe and from 3 to 4 hours to couple standard steel pipe. Additional time and expense is saved in laying rigid vinyl pipe by avoiding the use of heavy machinery and a large crew of men. One man was able to lower the 3-in. vinyl line into the ditch. The 20-ft. section of 3-in. rigid vinyl pipe weighed 19 lb. compared to the 150 lb. for 3-in. steel pipe.

After the plastic line had been joined, it was lowered into the 2-ft. ditch. Because the air temperature during installation was below the expected operating temperature of the system, it was necessary to provide only for thermal expansion of the pipe. The pipe was laid straight in the ditch, thus allowing sufficient width in the trench for subsequent snaking and adjustment of expansion.

Despite the cold weather, no difficulty was encountered in handling the pipe. Actually, the rigid vinyl was considerably warmer to the touch than steel pipe, and it could be handled without gloves.

Each section of the line was tested at 80 psi. air pressure and not one leak appeared in the entire 9,100 ft. of the system. This rigid polyvinyl chloride plastic pipeline was installed for Davidson Oil Co. by J. & J. Construction Co.

How to



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- **LOWER OPERATING COSTS...**
  A Slim Hole rig has lower capital investment, depreciation, insurance, taxes, maintenance, and will require much less fuel than a conventional "big" rig. To the operator this reduction of daily operating costs is reflected in logging, completion, round trip, and actual drilling time charges.
- **CHEAPER BITS...**
  As a result of research, the bearings and tooth structure of today's Slim Hole bits are more efficient than those of a year ago. In some areas the Slim Hole bit performance does not compare with the conventional sizes, but because of their lower cost, savings are still effected.
- **LESS DRILLING MUD...**
  The volume of mud required for the smaller hole will result in smaller mud bills, smaller mud pits.
- **SMALLER DRILL PIPE...**
  Because of the "hydraulic picture," it might be practical to use cheaper, small diameter pipe which has a low depreciation. If mud pump pressures are inadequate, the larger diameter, but cheaper tubing grades can be used and will result in less pressure losses.
- **LOW-COST MOVES...**
  Slim Hole rigs require less rig-up time, fewer loads, and cheaper site preparation.

Question: **What has increased interest in Slim Hole drilling?**

Answer: The fact that high well costs may strangle economic incentive to drill new wells is the major motive.

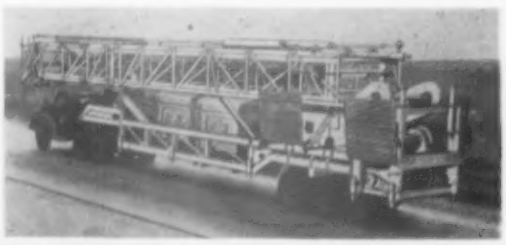
Oil companies are searching for ways to reduce drilling costs so they may continue to drill the growing number of wells necessary to maintain U. S. producing capacity.

Question: **What part does Slim Hole drilling play?**

Answer: Only one well in nine drilled in search of new oil finds production. Even in development drilling where nearly 50,000 wells are drilled annually, almost 40% are dry holes. In many areas, Slim Hole drilling will mean more wells for the same money.

Question: **What are the deterrents to industry-wide acceptance?**

Answer: Personal attitudes toward anything that deviates from convention is one drawback. However, tools are now available to fish, log, squeeze, cement, perforate, acidize, and install rods, hydraulic pumping or gas lift equipment inside of 2-inch tubing. This promising technique will get a fair chance only if operators are willing to concede some changes. For an example, in some hard formations, the smaller the hole, the greater the crooked hole problem. Today, the *operator* is receiving the most benefits of the Slim Hole technique and can obtain greater cost reductions by accepting a larger angle, a crooked hole, or ascertain some method to drill with lighter weight, either by drilling with a diamond bit, percussion bit, or with air or aerated mud techniques. This will require a thorough understanding of the principles of good drilling practice.



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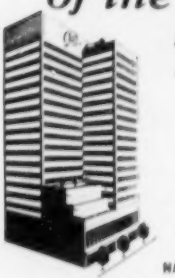

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Pipeline Patrol

. . . Report on Construction

McVean & Barlow Cleanup, Head for Home

McVean & Barlow, pipeline contractors of Odessa recently finished laying 30 miles of crude-oil lines from well-gathering systems southeast of Odessa to near Midland. The identification of the state is unnecessary as anyone who has been there can tell by looking at the picture that the setting is somewhere in West Texas. In the picture, an International TD-24 is shown in the final stages of the cleanup work.

Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

• **Big Horn Pipe Line Co.**—Firm has asked Wyoming Public Service Commission for permission to build a 150-mile, 8-in. crude-oil line from Ash Creek field, Wyoming, to a connection with Service Pipe Line Co.'s line at Midwest, Wyo.

Butte Pipe Line Co.—This jointly owned company of Shell Oil Co., Murphy Corp., and Northern Pacific Railroad has let contracts for its $18,000,000 crude-oil line from southeastern Montana to Guernsey, Wyo. Contractors and their spreads are:

Anderson Brothers Corp., Houston, 82 miles of 10-in. and 6½ miles of 12-in. from Glendive to Poplar, Mont.

Associated Pipe Line Contractors, Houston, sections 1 and 2, totalling 227 miles of 16-in. from the Montana-Wyoming state line to Guernsey.

O. R. Burden Construction Corp., Tulsa, 88 miles of 16-in. from Alzada, Mont., to Cabin Creek field near Baker. Company also has 15 miles of 12-in. in this area.

Magnolia Petroleum Co.—Company has let contracts on 215-mile, 12, 14, and 16-in. crude line from Midland to Corsicana, Tex. O. R. Burden Construction Corp. has the western half of the line and H. B. Zachry Co. has the eastern half. Work is scheduled to be finished by October.

Magnolia Petroleum Co. — This company will operate a 48-mile, 12-in. submarine pipeline for itself and Continental Oil Co., and Newmont Oil Co. The line will run to blocks off the coast of St. Mary's Parish, Louisiana, and will have a capacity of 50,000 bbl. per day. Brown & Root, Houston, has the contract and expects to be finished by the middle of 1955.

• **Malco Pipeline, Inc.**—Company is planning a 40-mile, 4-in. line from South Blanco Tocito field in Rio Arriba County, New Mexico, to Bloomfield, San Juan County, New Mexico. Completion set for 1955.

• **Stanmount Pipeline Co.**—Company is seeking permission to build a crude-oil line from fields in North Dakota to Cromer, Man., where it would hook up with the Interprovincial line. The line would cost $6,000,000. Size not known.

Trans Mountain Pipe Line Co.—Engineers Limited Pipeline Co. has contract to lay 27 miles of 20-in. from Laurel to Burlington, Wash., and 9 miles of 16-in. of lateral to Shell Oil Co.'s new refinery at Anacortes, Wash. The $2,750,000 job will begin in spring and end July 31.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members recently recommended that the project be dropped. They

Across the Continent.... Pipelines

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ANSUL

Pipeline Patrol

questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

• **California - Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

• **International Pipe Line, Inc.**—132 miles, 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive, Mont., to Minot, N. D.

Okan Pipe Line Co.—This subsidiary of Warren Petroleum Corp. has awarded work to two contractors for its L.P.G. line from western Oklahoma and Kansas to Tulsa. Vaughn & Taylor Construction Co. has 260 miles of 3 to 6-in. gathering lines, and R. H. Fulton has 140 miles of 6-in. transmission line from western Oklahoma into Tulsa.

• **Products Pipe Line Co.**—This subsidiary of Goliad Corp. has received a fast writeoff for 40 per cent of $126,000 and 25 per cent on $1,781,000 for L.P.G. line from the Wilcox natural-gasoline plan in Lavaca County, Texas, to Texas City. Panama-Williams Co. has contract. Completion scheduled for mid-summer.

Shell Pipe Line Corp.—65 miles of 12-in. products line from Baton Rouge, La., to Shell's Norco refinery. Houston Contracting Co. has contract. H. T. Muckley, Supt. Job to be completed in June.

Sioux Oil Co.—Company will build a 55-mile products, 8-in. line from its Newcastle, Wyo., refinery to Rapid City, S. D.

Southern Pacific Pipe Line, Inc.—Company has let approximately 530 miles of its 800-mile products line between Los Angeles and Phoenix-Tucson, and El Paso and Phoenix-Tucson. Contractors and their spreads are:

Morrison-Knudsen Co., Inc., Los Angeles, and River Construction Co., Fort Worth, have 180 miles of 8-in. between El Paso and Lordsburg, N. M.

R. H. Fulton & Co., Lubbock, Tex., has 150 miles of 8 and 10-in. from Lordsburg to Tucson.

R. A. Conyes Construction Co., San Pablo, Calif., has 200 miles of 12-in. between Colton, Calif., and Yuma, Ariz.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has received Federal Power Commission approval to abandon the "Little Inch" gas line and to convert it to products service. The company will spend $13,000,000 converting the line back to products. When finished the line will have a capacity of 235,000 bbl. daily.

Coal Pipelines

Pittsburgh Consolidation Coal Co.—This firm has announced plans for the first pipeline to move coal. The line will be 108 miles of 10-in. from the company's Georgetown mines in eastern Ohio to Cleveland

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Pipeline Patrol

Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Construction will start this fall as soon as right-of-way can be procured. Ford, Bacon & Davis, Inc., will issue specifications, let contracts, and supervise the construction work.

Natural-Gas Pipelines

• **Alabama-Tennessee Natural Gas Co.**—Company has proposal before FPC to lay 21 miles of 12-in. line west from its present line in Colbert County, Alabama.

• **American-Louisiana Pipe Line Co.**—1,121 miles of 30 and 22-in., 30-in., proposed, extends from North Tepetate, Acadia Parish, Louisiana, to near Detroit. The 22-in. starts near Payne, Ohio, extends to Bridgman, Mich. Estimated cost: $130,000,000. FPC approved.

• **Arkansas Louisiana Gas Co.**—136 miles of new line proposed, to be added to present system in Arkansas, Louisiana, and Texas. Estimated cost: $9,245,166. FPC approved.

Atlantic Seaboard Corp.—Company has received FPC authority to lay 84 miles of natural-gas line in West Virginia, Virginia, and Maryland. The 26-in. line will parallel existing lines between Cobb, W. Va., and Baltimore. The job will cost $9,281,500 and will include 2,000 hp. additional compressor capacity. Finish scheduled for this summer.

• **Carolina Natural Gas Corp.**—185 miles 2-12-in., proposed lateral lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

• **Cities Service Gas Co.**—Company has applied to the Federal Power Commission for permission to build a 93-mile, 26-in. natural-gas line from Blackwell, Okla., to Independence, Kans. The company also proposes to build a 145-mile gathering system in Woods County, Oklahoma, and Barber County, Kansas. The two jobs will cost $8,422,400.

• **Clinchfield Coal Corp.**—Company has filed permit with Federal Power Commission for authority to build 16-mile, 12-in. line from Dickenson County, Virginia, to near Osborne Gap, Ky. The company is primarily a coal producer.

• **Coastal Transmission Co.**—Company plans to build 550 miles of 30-in. line from near McAllen in South Texas to near Baton Rouge (See Houston, Texas Gas & Oil Co.)

Colorado Interstate Gas Co.—Company has let first part of its 380-mile, 22-in. line from Rock Springs, Wyo., to Denver to Houston Contracting Co. The construction firm is working on 126 miles from near Laramie, Wyo., to Denver. The line will pick up its gas from Pacific Northwest at Rock Springs.

Colorado Interstate Gas Co.—Company is also spending $4,200,000 extending its gathering lines in the Panhandle of Texas, Oklahoma, and Kansas. Work will be done this summer.

• **Colorado-Western Pipe Line Co.**—454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay, and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

East Ohio Gas Co.—Company has let contract to Williams Brothers Co. to lay 112 miles of 30-in. from Maumee, Ohio, to Cleveland. Completion is set for October 1.

• **El Paso Natural Gas Co.**—Company has three plans ready to present to the FPC to increase its California capacity. The preferred plan calls for the company to loop its 500-mile, 30-in. line from the San Juan basin to the California border with a 34-in. line. If this fails to win approval, the firm will offer to build a 30-in. line from Pacific Northwest's line at Mountain Home, Idaho, to the San Francisco area. Another plan is to build a 30-in. line from near Pendleton, Ore., into California. Company feels the looping program will be required even if one of the alternate plans would win approval.

• **Hope Natural Gas Co.**—Proposing to build a 22½-mile extension of existing line from Boone County, West Virginia, to Logan-Mingo county line, West Virginia. Estimated cost: $930,000.

• **Houston, Texas Gas & Oil Co.**—Company plans to build 600 miles of 30-in., and 350 miles of 18-24-in. line to carry natural gas from Baton Rouge to Miami. Line will join with Coastal Transmission's proposed line from McAllen, Tex.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Proposes to construct 206 miles of 6-12-in. pipeline to add to present system in central and northeastern Nebraska.

• **Lone Star Gas Co.**—Company has two plans up before FPC to enlarge its system in Texas and Oklahoma. One is for an $18,000,000, 230-mile line from Cotton County, Oklahoma, to Fritch, Tex. The other plan is for a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. The company hopes to prevent Natural Gas Pipeline Co. of America from building its line from Wise County, Texas, to Fritch (see below).

• **Michigan Consolidated Gas Co.**—25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Gas Storage Co.**—Company

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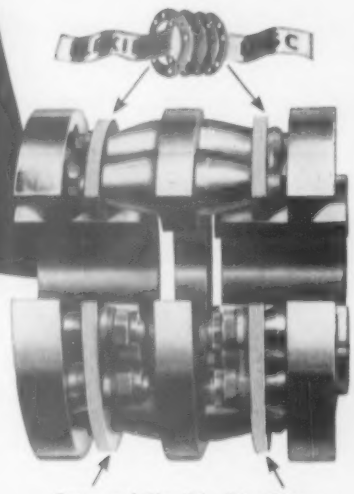

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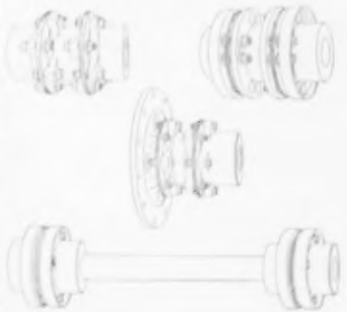

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Pipeline Patrol

has applied to FPC for permission to construct 36 miles of 16-in. natural-gas line from Mount Pleasant Junction to Milwaukee, Mich. The project will cost approximately $2,572,000.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in. loops. Majority will be in Wisconsin.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

• **Natural Gas Pipeline Co. of America.**—Company now before FPC on plans to build 350 miles of 20 and 26-in. line from Wise County, East Texas, to its station 111 at Fritch, Tex.

• Company also plans to start 31 miles of 36-in. in July from Herscher, Ill., to a connection with Texas Illinois pipeline near Joliet, Ill. Job slated to be finished in November.

Natural Gas Producers, Inc.—Company has let contract to Houston Contracting Co. for 49 miles of natural-gas transmission line from northeastern Colorado to Denver, and 13 miles of distribution lines. The job will cost $1,374,000 and is expected to be completed in early July.

Nevada Natural Gas Co.—Company plans looping program along its 114-mile line from Needles, Calif., to Las Vegas, Nev. Mileage and size are unknown but cost will be about $2,500,000.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **New York State Natural Gas Corp.**—Company plans to start laying in June 18 miles of 20-in. pipe from Homer, Cortland County, New York, to its station in Otisco, Onondaga County, New York.

• Company also has plans for 21 miles of 20-in. from Genessee Falls, Wyoming County, New York to York, Livingston County, New York. No definite starting or completion dates announced.

• **Niagara Mohawk Power Corp.**—Company plans no major transmission lines for 1955. However, itp lans to add more than 300 miles of distribution mains.

• **Northern Natural Gas Co.**—Company has the following jobs before the FPC for approval.

• Canadian Extension—188 miles of 24-in. from Canadian border to near Wahpeton, N. D. 215 miles of 30-in. from Wahpeton to Farmington, Minn.

• South Dakota Extension—94 miles of 12-in. from Sioux Falls to Waterton-Huron. 71 miles of 10-in. from Waterton-Huron to Duluth-Superior.

• Duluth-Superior Extension—167 miles of 24-in. from Farmington to Duluth-Superior.

• Company has also asked FPC permission to build and operate $4,800,000 worth of pipeline facilities for use in testing an underground natural-gas storage field near Redfield, Iowa. The project would involve construction of 29 miles of 30-in. pipe.

Pacific Gas & Electric Co.—Company is working on 18 miles of 12-in. from Beehive Bend field to W/O Gridley in California. The job is slated for completion in September.

• Company plans 21 miles of 16-in. line from Marysville to Lincoln, Calif. Job will start in June and wind up in September.

• Company's long-range plans call for looping the Topock-Milpitas line with 135 miles of 34-in. The major part of the line will be laid in 1956, while 62 miles will be laid in 1957.

Pacific Northwest Pipe Line Corp.—Firm has let the initial contracts of its 1,466 miles gas line from the San Juan basin to Bellingham, Wash. The first contracts total $11,236,000. Contractors and their sections are:

River Construction Co., two sections totalling 150 miles of 26-in. between Ignacio, Colo., and Moab, Utah.

R. H. Fulton Co., two sections totalling 160 miles of 26-in. between Moab and Jensen, Utah.

Associated Pipeline Contractors, Inc., one section of 77.6 miles of 26-in. between Jensen and Green River, Wyo.

A. J. Curtis Construction Co., one section of 82.8 miles of 22-in. from Green River to Sage, Wyo.

B & M Construction Corp., one section of 90 miles of 22-in. between Sage and Lava Hot Springs, Idaho.

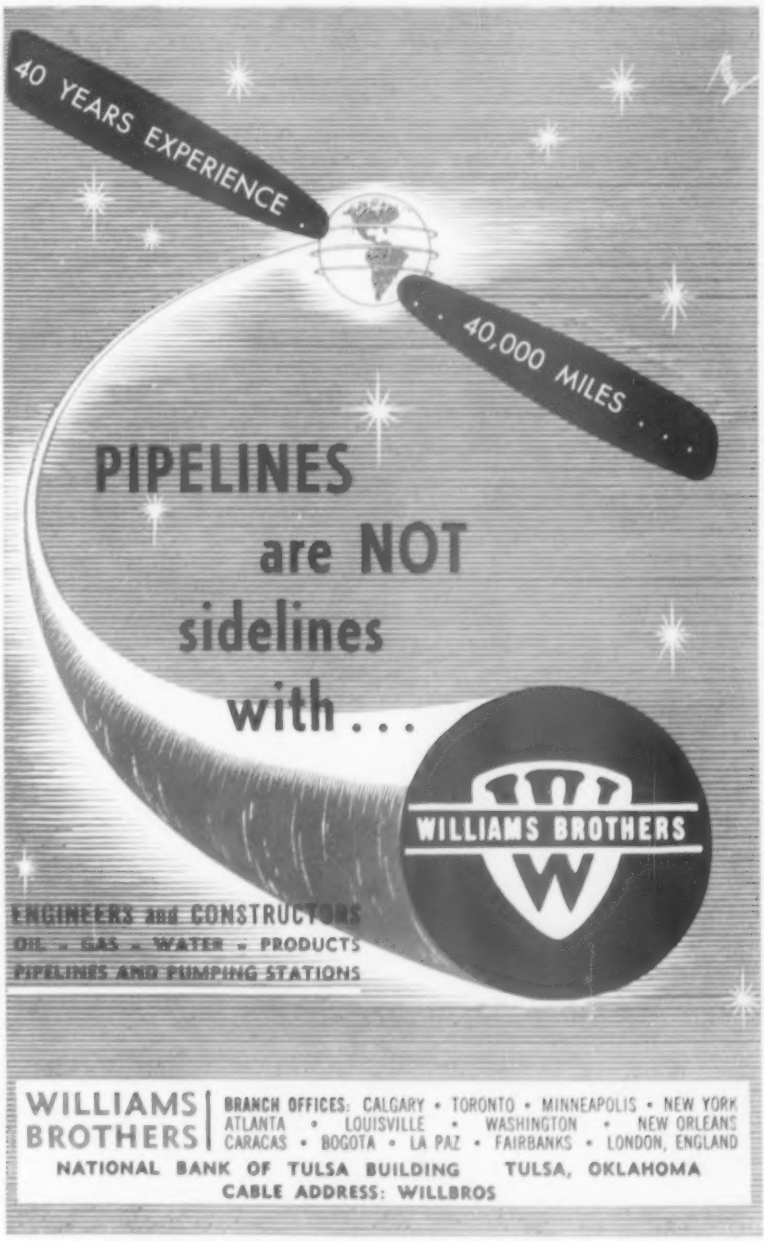
Midwestern Constructors, Inc., one section of 95 miles of 22-in. from Lava Hot Springs to Burley, Idaho.

• **Panhandle Eastern Pipe Line Co.**—Company has plans to loop Peoria lateral before FPC now. The line would be 16-in. pipe running 58 miles from near Springfield to Peoria, Ill.

• **Texas Eastern Pipe Line Co.**—Company plans to build 382 miles of 24-in. from Castor, La., to its main line at Kosciusko, Miss. This cross-over will enable the firm to move enough gas in the existing line from Kosciusko to Connellsville, Pa., to replace the Little Inch, which the firm hopes to convert to products. The FPC is hearing the conversion idea now. The conversion and the laying of the new line will cost approximately $71,000,000.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design, estimated the line would cost $20,000,000,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Pipeline Patrol

although later figures have been much higher than this.

South Georgia Natural Gas Co.—Company has let contracts on work approved by the FPC in 1954. The total cost of the projects is nearly $9,000,000.

Buchanan Pipe Line Co. has 85 miles of 3, 6, and 8-in. line in the State of Georgia.

Halimac Construction Co. has 97 miles of 10-in. line from Albany, Ga., to Ellaville, Fla.

Mid-States Construction Co. has 110 miles of 2, 4, 6, and 12-in. line in Alabama and Georgia. Seventy-one miles of the line is 12-in. from Phenix City, Ala., to Americus, Ga.

Thomason & Associates, of Montgomery, Ala., has 35 miles of 12-in. and about 8 miles of smaller in Alabama and Georgia.

Tennessee Gas Transmission Co.—Company has awarded Oklahoma Pipe Line Constructors 113 miles of 24-in. natural-gas line from near Covington to Laska-Waxen, Pa. The work has started.

Company has also awarded H. C. Price Co. 130 miles of 24 and 26-in. pipeline in Ohio and Pennsylvania.

• Company has also received FPC permission to construct a 30-in. line, 370 miles long from Agua Dulce, Tex., to Kinder, La. The line will cost $35,400,000.

• **Tennessee Gas Transmission Corp.**—Firm has requested FPC permission to spend $56,000,000 in new pipeline and compressor facilities. The work will include 221 miles of 26- and 30-in. loops in Kentucky and Ohio and 376 miles of gathering lines in Louisiana and Texas. Some 12,540 hp. would be added at new and existing compressor stations in Louisiana, Mississippi, and Texas.

Texas Eastern Transmission Co.—Company is awaiting FPC permission to begin converting its Little Inch line from natural gas to products service. FPC is presently hearing arguments by a group of Mississippi River barge operators who oppose the project. Company has also proposed to Mobilization Director Arthur S. Flemming that the Government give it accelerated amortization on money to invest to put the Big Inch line on standby products service. The company's program is:

. . . To convert the Little Inch to products with a capacity of 235,000 bbl. daily and to install enough standby pumping equipment to hike the capacity to 375,000 bbl. daily if needed.

. . . To install standby pumping equipment along the Big Inch that would allow the line to be converted from gas to products in an emergency. The line would have a capacity of 425,000 bbl. daily.

. . . To build a 382-mile, 24-in. natural-gas line from Beaumont to Kosciusko, Miss., to connect with an existing 30-in. line running to Connellsville, Pa. The company proposes to build enough standby compressor capacity to enable the line to take over both the Big and Little Inch capacities in case of war.

The Texas Eastern proposal clashes with a plan of American Pipe Line Co. to build a line from the Gulf Coast to New Jersey (See table under products).

Texas Gas Transmission Corp.—Company has big building program set to start soon and end approximately November 1.

From Covington, Ky., to Jefferstown, Ky., company will build 77 miles of 26-in.

Company will loop 14 miles of 20-in. at Vaughton, La.

Will build 72 miles of 12-in. from Hardinsburg, Ky., to Bedford, Ind. Also will build 5 miles of 8-in. near Bedford.

From Bastrop, La. to Clarksdale, Miss., the company will lay 50 miles of 30-in.

From Eunice, La., to Morgan City, La., the firm will lay 105 miles of 20 in.

Transcontinental Gas Pipe Line Corp.—Company has awarded the following contracts to lay 315 miles of 36-in. and 219 miles of 30-in.

O. R. Burden Construction Corp. will lay 5.31 miles of 36-in. and 25 miles of 30-in. in Louisiana.

Associated Pipe Line Contractors, Inc., will lay 63 miles of 36-in. in Louisiana and Mississippi and 71 miles of 30-in. in Virginia and Maryland.

Midwestern Constructors, Inc., will lay 14 miles of 30-in and 54 miles of 36-in. in Alabama and Georgia.

Western Constructors will lay 77 miles of 36-in. in Georgia and South Carolina.

Panama-Williams Co. will lay 36 miles of 30-in. and 31 miles of 36-in. in South Carolina and North Carolina.

Williams Brothers Co. will lay 72 miles of 30-in. in Virginia.

Transok Pipe Line Co.—Company has let contract to Pipe Line Service Co., Seminole, Okla., to lay a 140-mile, 24-in. line from Garvin County, Oklahoma, to Tulsa. The firm will also build a gathering system in the Bradley, West Lindsay, and Northwest Purdy fields.

• **Trunkline Gas Co.**—Firm has applied to FPC for authority to build eight new compressor stations and 24 miles of pipeline on its transmission system to enable it to sell additional gas to Panhandle Eastern Pipe Line Co. Total capacity of the new stations would be 56,000 hp. Total cost would be $18,700,000, including $1,000,000 for gathering facilities in the Gulf Coast area. Panhandle filed for 1,600 hp. additional compressor capacity to cost $3,714,000.

• **United Gas Pipe Line Co.**—Company has applied to FPC for permission to construct 63 miles of 16 and 20-in. natural-gas line in Mississippi, Alabama, and Florida. The company will also add 330 hp. to its compressor stations. Cost for the job will be about $8,300,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Wilcox Trend Gas Gathering System, Inc.—Company is spending over $1,000,000 building gas-gathering lines and compressor stations in the Cuero-Goliad area of South Texas.

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to build a 400-mile, 16-in. crude line from Plaza Huincul area to Bahio Blanca.

Bolivian Government—Williams Brothers has contract to build a 220-mile, 6-in. crude-products line from Cochabamba to Orura to La Paz. The line is described completely in The Oil and Gas Journal of May 16, 1955, page 136.

Canadian Gulf Pipe Line Co.—Williams Brothers has contract to build 17 miles of 4-in. and 36 miles of 6-in. for this company from Clive and Joffre fields to its connections at Stettler.

• **Peace River Oil Pipe Line Co., Ltd.**—Company has been granted a permit to lay a 106-mile line from Sturgeon Lake field in Northwest Alberta to the Edson pumping station of Trans Mountain Oil Pipe Line Co., Ltd. The project will include a 16-in. line from Sturgeon Lake to Iosegun Lake and a 12-in. line from there to Edson. Capacity will be 58,000 bbl. daily.

• **Petroleos Mexicanos.**—145 miles, 12-in. considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

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72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

• **Standard - Vacuum Oil Co.**—Company has long-range plans for a 90-mile pipeline to give the new Lirik field in Central Sumatra an outlet. Completion is not scheduled before 1957 or 1958.

• **Westspur Pipe Line Co.**—This company sponsored by Imperial Oil, Ltd., proposes to build a crude-oil line from southern Manitoba and Saskatchewan to a connection with the Interprovincial system running from Edmonton to Sarnia.

Yacimientos Petroliferos Fiscales Bolivianos—Williams Brothers has contract to build a 230-mile, 6-in. products line from Cochabamba-Oruro-La Paz. The line will cost approximately $7,000,000. The Bolivian Government will eventually add a 10-in. products line from Oruro to Arica, Chile.

• **Others.**—For plans for further crude lines in Canada that have not yet been fully formulated, see The Oil and Gas Journal, April 4, page 79.

Foreign Products Pipelines

• **Empresa Nacional del Petroleo.** — 80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of South Rhodesia and Portuguese East Africa.** — 200 miles, considered. Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

• **Iraq Petroleum Co., Ltd.**—Company is making plans to lay a 75-mile, 24-in. products line from Homs, Syria, to Tripoli, Lebanon. The line would have a capacity of 180,000 bbl. daily.

• **National Fuel Oil Co.**—This company in Israel is a shareholder in a company which plans to build a products line between Haifa and Tel Aviv. The plans call for a 55-mile 6-in. line in which the Government would own 10 per cent.

• **National Iranian Oil Co.** — Company plans $32,300,000, 573-miles, 10-in. products pipeline from Ahwaz to Teheran, Iran. The line will have a capacity of 40,000 bbl. daily. Costain-John Brown, Ltd., London, will build the 337-mile southern part. Entrepose, Paris, will build the northern 236 miles.

• **North Atlantic Treaty Organization (NATO).**—This defense organization is building products lines to airforce bases in various parts of France. Approximately 2,000 miles of 4-10-in. line will be laid.

Oleoducto del Pacifico, S.A.—Company is building 100-mile, 6 and 8-in. products line from Buena Ventura to Cali, Colombia. Pipeline Engineering Co. of Dallas, Tex., has the engineering contract. Williams Brothers is laying the line.

Overland Pipeline Corp.—This South African firm has requested government permission to build a 350-mile line, to cost $8,450,000, from the South African coast to Rand, a plateau area in southern Transvaal where there is heavy petroleum consumption.

• **Petroleos Mexicanos.**—124 miles, 6-in. planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in. planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in. planned, Salamanca to Lagos, Mexico.

• **United States Government.** — 375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

U. S. Defense Department.—U. S. Defense Department is sponsoring a 485-mile, 8, 10, 12-in. products line from Cadiz to Zaragoza, Spain. The contract has been let to Merritt, Chapman & Scott; Benson & Root, of Oklahoma City; and Agroman Construction Co., a Spanish firm. Brown-Raymond-Walsh is the prime contractor. Cost of the line will be approximately $5,000,000.

Winnipeg & Central Gas Co.—Canadian company plans to build a $20 million butane-propane system. Company plans to get gas L.P.G. from Signal Oil & Gas Co.'s Tioga, N. D., plant and move it to Winnipeg. Size and route of the line has not been definitely established.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering contracts to two firms, Dutton, Williams Brothers, Ltd. and Mannix, Ltd., for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

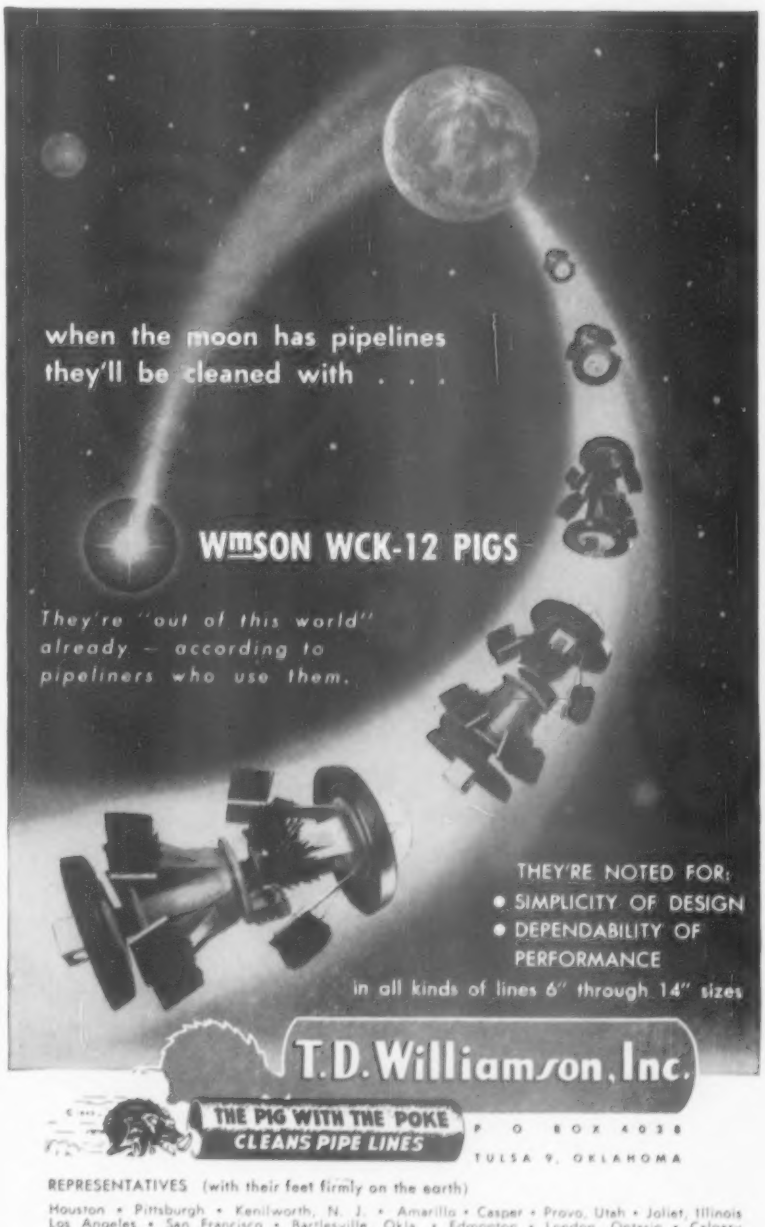
Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakistan.

• **Canadian Western Natural Gas Co.**—Firm will begin work this spring on a $1,000,000, 59-mile natural-gas project in southern Alberta. The company will also add a compressor station at Lethridge, Alta.

• **Empresa Nacional del Petroleo.** — 80 miles, 10-in., planned, Concon to Santiago, Chile.

South Alberta Pipe Line, Ltd.—Company has filed permit to construct a 150-mile, 8-in. natural-gas line from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta. The line will cost about $1,000,000.

Trans-Canada Pipe Lines, Ltd.—Company has postponed start of 2,250 miles of 24-34-in. line from Alberta-Saskatchewan border to Toronto and Montreal until next year because of financing difficulties. Company also plans a 24-in. lateral from Winnipeg to Emerson, Man. Twenty-inch lateral from Niagra to Toronto now in operation. Plans for line to enter U. S. may be considered.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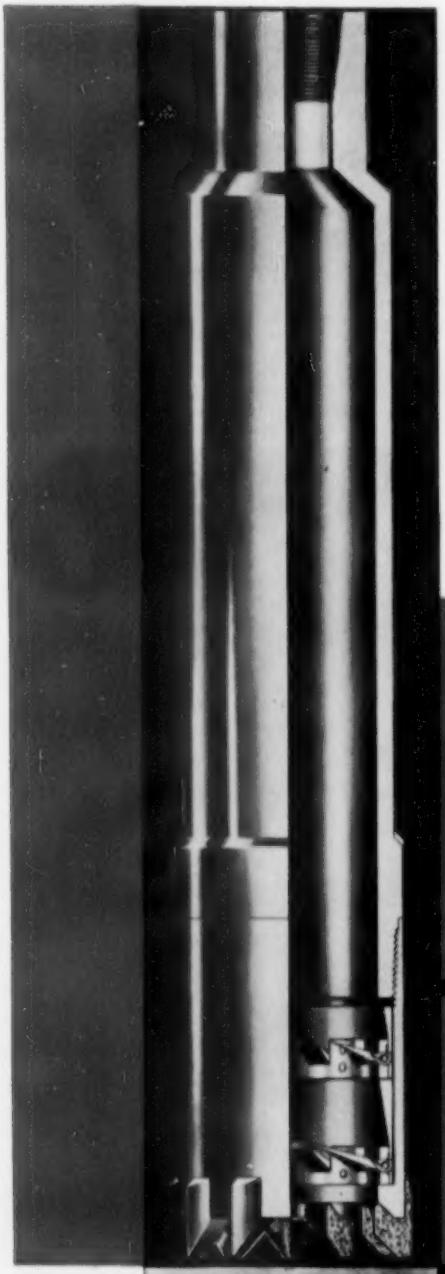
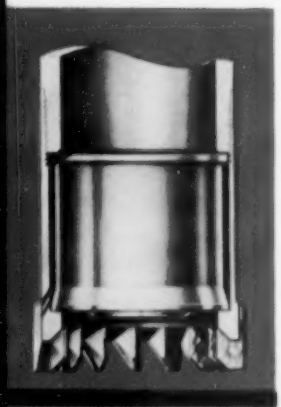


Your best bet in...
any drilling emergency!

GLOBE JUNK CATCHERS

with Interchangeable Dog-Type and Magnet-Type Catchers



When drilling emergencies occur, the "Globe" with interchangeable dog-type and magnet-type catchers, is ready for fast, complete recovery. It will pick up junk and fish of all descriptions . . . snarled wire and scrap to broken slips. With the large capacity barrel, the "Globe" frequently makes a complete recovery in one run.

For fast, low-cost junk recovery . . . insist on "GLOBE."

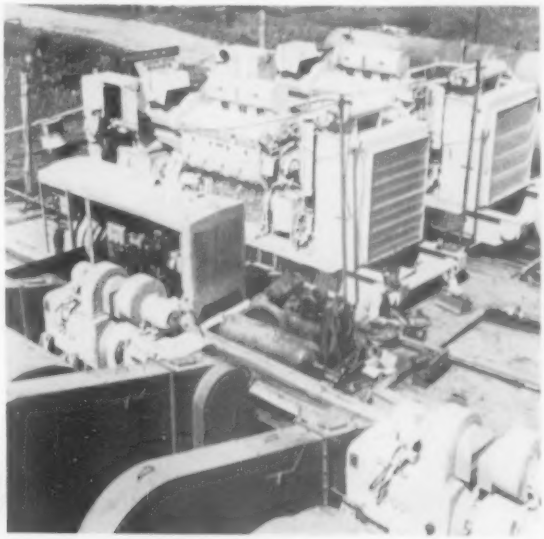
Photos illustrate the exceptional strength and holding capacity of both the Globe dog-type and magnet-type catchers.

GLOBE
OIL TOOLS COMPANY
GLOBE OIL TOOLS
Serving the Petroleum Industry

Main Office and Plant: LOS NIETOS, CALIFORNIA
Branches are located in all principal drilling areas.

Among the

Drilling Contractors



Left: Offshore Co.'s new diesel-electric rotary rig on wildcat location near Houma, on Louisiana Gulf Coast. Right: Diesel-electric power units (upper right) on Offshore Co.'s rig. Mud pump motor installation appears in foreground.

Deep Drilling Rig Uses Locomotive-Type Power

High horsepower, locomotive-type diesel-electric power units are being used on a new deep-drilling rotary rig Offshore Co., of Baton Rouge, is operating in contract drilling on the Louisiana Gulf Coast.

The rig is on its first hole, a 12,000-ft. wildcat test for Louisiana Prospecting Co. in Lafourche Parish, 5 miles northwest of Houma and 3½ miles southeast of Lafourche Crossing field. Later, it will be mounted on a barge for drilling in the Gulf of Mexico.

Two power units are on the rig. Each has an 8-cylinder General Motors 567 C two-cycle engine developing 875 continuous horsepower at 835 r.p.m. The engine and generators, generator-control cabinet, engine-cooling equipment, and other accessories are mounted compactly on a portable skid.

Direct current is supplied to the rig's 625-hp. motors, which, single or in pairs, drive the mud pumps, draw works, and rotary table.

This is the first application of locomotive-type power units in drilling. Such units, in use on North American railroads more than 20 years, were developed by Electro-Motive Division of General Motors to meet requirements of locomotive operation for an extremely lightweight and compact, yet high-horsepower, flexible power system, providing high starting torque and a wide speed range.

Western Drilling Co. has contract for a Cisco area wildcat in Grand County, Utah. It is being drilled for Cabeen Exploration Co. at 1 State, C NE NE 36-20s-21e. This wildcat will test to the Dakota.

Casey & Montgomery, Bakersfield, Calif., are starting another deep step-out test northwest of Tejon field, 25 miles southeast of Bakersfield, in southern Kern County, California. It is a contract operation for Reserve Oil & Gas Co. Location, in 20-11-19, is more than 2 miles from production. Hole is to be carried to the basalt, expected at 9,000 ft.

Maxwell Herring Drilling Corp., Tyler, Tex., is drilling at a wildcat location 5 miles northeast of Montalba, in Anderson County, East Texas. It is a joint operation for Maxwell Herring, owner of the drilling firm, and Hunt Graham. Location, in the J. B. McNealy Survey, is for 1 Connaway. Hole is projected to 5,800 ft. The company also has a new contract job in Titus

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Rockwell-Built
MUD VALVE

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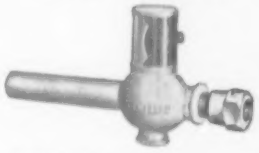

Will Fire Almost Any Boiler

With the INFERNO oil burner it is possible to fire anything from a small rivet-heating furnace to a 150 h.p. oil field boiler. Yet Inferno oil burners are made in only one size—¾" fuel connection and ¾" steam connection. Write for Bulletin No. 24.

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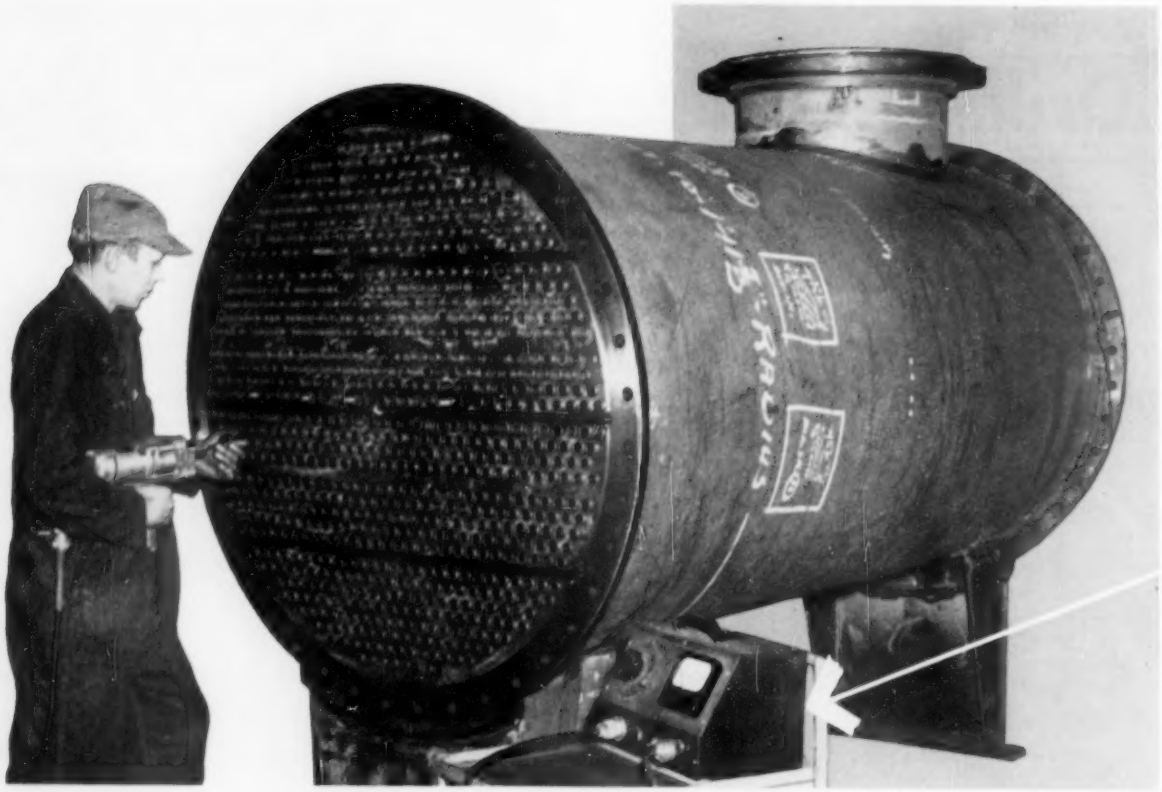

ELECTRUNITE uniformity makes this

Republic Stainless Steel Pressure Tubes Prove Ideal for Use with

This handy device is an important tool in the fabrication of heat exchangers and condensers at the Colonial Iron Works in Cleveland, Ohio. Based on torque load, it standardizes on the degree of rolling in tubes — helps speed up exchanger and condenser assembly. When tube expansion reaches a predetermined setting, a warning light flashes. The machine cuts off power to the mandrel and the tube is accurately and tightly rolled.

There's just one catch, however. Tubes must be uniform in quality and ductility in order to best utilize this automatic control. It cannot determine, for example, a variance in hardness. A tube inconsistent in this important feature might be over-rolled or under-rolled. Result: a costly delay.

That's why the Colonial Iron Works depends on ELECTRUNITE® Stainless Steel Heat Exchanger Tubes. They know ELECTRUNITE Tubes are consistently uniform. *Wall thickness* is uniform with no longitudinal thin spots. *Diameter* is uniform, which means tubes slide easily and quickly through holes in drums or headers. *Hardness* of the steel is uniform throughout because they are fully annealed in the latest-type controlled-atmosphere furnaces. And since tubes expand

REPUBLIC

World's Widest Range of Standard

watchdog efficient

Automatic Tube Rolling Controller

evenly due to uniform *ductility*, there's less danger of over- or under-rolling.

Republic, the world's largest producer of stainless and alloy steels, pioneered the widespread use of stainless, as well as the manufacture of stainless tubing. More than 25 years' experience in shell and tube equipment is reflected in the popularity of these products throughout the world.

Specify Republic ELECTRUNITE Pressure Tubes on your next order for new heat exchangers or retubing. They're available in carbon as well as stainless analyses. For more information send coupon.

STEEL

Steels and Steel Products

UNIFORM QUALITY MAKES REPUBLIC CONTINUOUS BUTT WELD PIPE A POPULAR ITEM IN THE OIL COUNTRY for gathering lines, distribution and general maintenance work. A standard in the oil and gas industry for years, it features uniform ductility and strength; tight adherence of the galvanized coating; ease of threading, bending and welding. Available in economical double-random lengths. Call your Republic Distributor.

REPUBLIC CHAIN HAS A VARIETY OF USES IN THE OIL AND GAS INDUSTRY. Here, Republic Chain secures a heavy load of Republic Electric Resistance Weld Line Pipe for trucking to the job site. Republic's Round Chain Division also supplies chain for binding, hauling, hoisting, and towing; alloy spinning chain; and many types and sizes of chain slings. Truck and tractor tire chains, too. Coast-to-coast warehousing assures prompt delivery.

DEPENDABLE REPUBLIC FASTENERS ARE FOUND WHERE THERE ARE TOUGH JOBS TO BE DONE. The rugged alloy studs used here on gas boosters are just one of more than 20,000 regular items made and stocked by Republic for every fastening need. Clean, accurate threads provide maximum holding power, resistance to wear and trouble-free backoff for maintenance. Specify Republic fasteners on your next order. Your industrial distributor has them.

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County, East Texas, getting under way. It is for L. A. Stemmons at 1 Bird Ould, Sr., in the James Gahagan Survey, 2¼ miles west of Cason.

Glasscock-Wilson, Inc., Shreveport, has contracted for a projected 10,500-ft. test Republic Natural Gas Co. is undertaking at a wildcat location 2 miles south of Raceland, in Lafourche Parish, southeastern Louisiana. Location in 36-16s-19e, is for 1 South Coast Corp.

T-W Drilling Co., New Orleans, is contracting for Richardson & Bass in the Little Lake area, Jefferson Parish, Coastal Louisiana. Its rig now is going to 10-B Cal-Nat.-State Lease 2453 Unit, in 16-18s-23e, for an 11,700-ft. well.

Goldrus Drilling Co., Houston, is moving a rig to the Live Oak area, in Vermilion Parish, Coastal Louisiana, where it will drill under contract for Wherry, Green & Martin. A 12,350-ft. test is planned at 1 Foster Unit, in 87-14s-3e.

Appell Drilling Co., Alice, Tex., has a new wildcat operation under way 1½ miles east of Sandia, in Jim Wells County, South Texas. It is a 6,000-ft. contract job for Texas State Petroleum, Inc., at 1 Gallagher, in the J. C. Dibrell Subdivision of the Wade Ranch Survey.

Trant Drilling Co. is contractor on a 9,400-ft. Travis Peak wildcat test Purnell & Coleman and associates are starting in the Samuel Carson Survey, 6 miles north of Mount Vernon, in Franklin County, northeastern Texas. Location is for 1 Campbell.

Coastal Drilling Co., Los Angeles, will be the contractor on Sinclair Oil & Gas Co.'s projected rank wildcat test in western Lane County, in the Pacific Coast area of western Oregon. The test, 1 Federal - Mapleton, in 12-16s-10w, near Mapleton, is scheduled to go to 12,000 ft. Coastal will use its heavy rig now drilling for Richfield Oil Corp. in Los Lobos field, 9 miles east of Maricopa, Calif. It is the same rig Coastal used in drilling two deep tests early this year on Santa Cruz Island, 22 miles off the California coast from Santa Barbara. Bud Fletcher is tool pusher.

Carter-Jones Drilling Co., Kilgore, Tex., has moved a rig to a wildcat location a mile southwest of Bivins, in Cass County, East Texas, for a 7,600-ft. test for Sunray Mid-Continent Oil Co. Location is for 1 Grogan, in the William Donaho Survey.

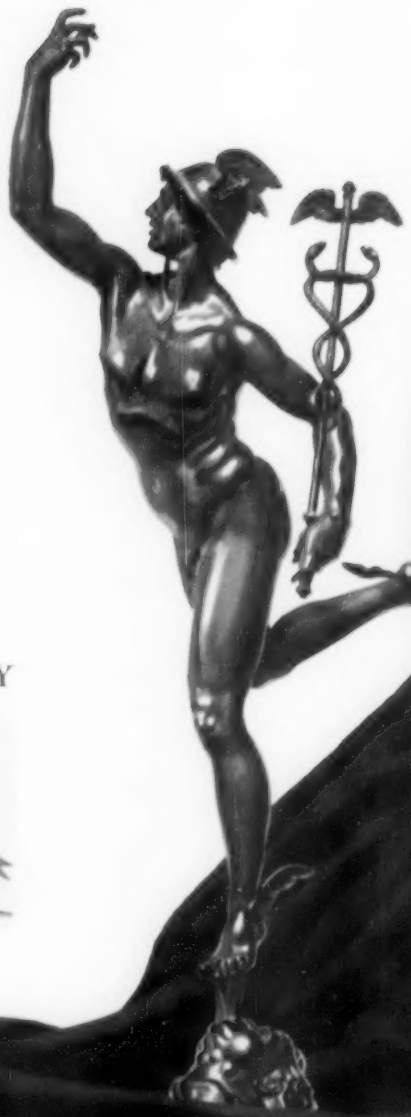
Service
is a commodity
having only
one true value

it is good
or it
isn't service

MERCURY – *symbol of fleet-footed service*

Service, it has been said, is a commodity having only one true value—it is good or it isn't service.

The Fluid Packed Pump Co., in recognition of this basic philosophy, has endeavored to make available to the user of its products a good and useful service—a service that begins with product design and charted by experience to include the fundamentals essential to successfully carrying out this responsibility, all of which adds up to having men, material and equipment where it is needed when it is needed.



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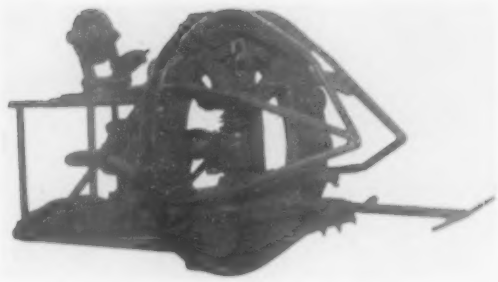
. . . What's New in Equipment?

Use the handy Time-Saver Cards ✓✓✓ to obtain additional information on these items

by Dan B. Miller



New Line-Up Clamp Is Air Powered

This 36-in. air-powered lineup clamp aligns, rigidly holds, and shapes line pipe during welding. Lineup of the pipe is accomplished by a circular expanding ring which engages the inside edges of the pipe joints. Rollers are used around the ring to reduce friction between the clamp and the pipe.

The ring is operated by a jack box powered by an air motor. An extendable arm on the clamp prevents undue retraction of the expanding ring and damage to the jack box. This arm pivots and connects with a bar that closes the valve supplying air to the motor. The clamp is available for pipe in diameters from 26 to 48-in. A compressor, which can be mounted and operated by a sideboom tractor, is available with the lineup clamp. *M. J. Crose Co., Inc.*

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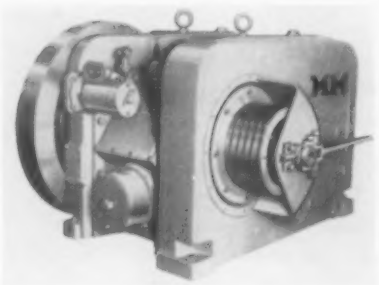

Timeline Engine Designed To Run Year Without Service

A radically new engine is designed to run continuously for 1 year without service. The 20 b.hp., 2-cylinder engine is designated MM Timeline 168.

A totally new radial-cooling system replaces the conventional radiator. Also eliminated are water pump, pulleys, fan, fan belt, and radiator hoses. Water is circulated through a cast-aluminum cooling unit built into the flywheel.

During 1954 and 1955, a number of these long-running units have been operating continuously without service of any kind for 24 hours a day in oilfield pumping installations. Reports from these different locations indicate operation of at least 1 year without any service.

The new engine has a crankcase ventilating system that draws air into the crankcase through a filter breather. Vacuum draws the air and crankcase vapors to the intake manifold before those vapors can settle. Power-take-off housing, clutch shaft, and bearings are unnecessary because the V-belt pulley flange is mounted direct to the drive ring on the power-take-off end of the crankshaft.

On installation, the clutch-shifter lever may be rotated to any of 12 different positions depending on direction of belt drive. The housing serves as a belt guard as well. *Minneapolis-Moline Co.*

Check No. 2 On The Time-Saver Card

Aqua-Kleener Conditions Injection, Disposal Water

Aqua-Kleener is for conditioning oilfield water for subsurface injection, offshore disposal, or surface disposal. The oil traces and solids are removed from the water through a process of settling and filtering.

Aqua-Kleener equipment consists of four vessels; oil skimmers; filters; backwash tanks; and the Filta-wash, which combines the filter and backwash tank into one vessel. Each vessel is utilized

separately or in various combinations depending upon the type of application and the degree of water treatment required.

The Aqua-Kleener is a closed-type system which reduces precipitation due to oxidation of iron, minimizes corrosion, holds carbon dioxide in solution, retards aerobic-bacteria growth, and in most cases eliminates the need for chemical treatment of the water. *Black, Sivalls & Bryson, Inc.*

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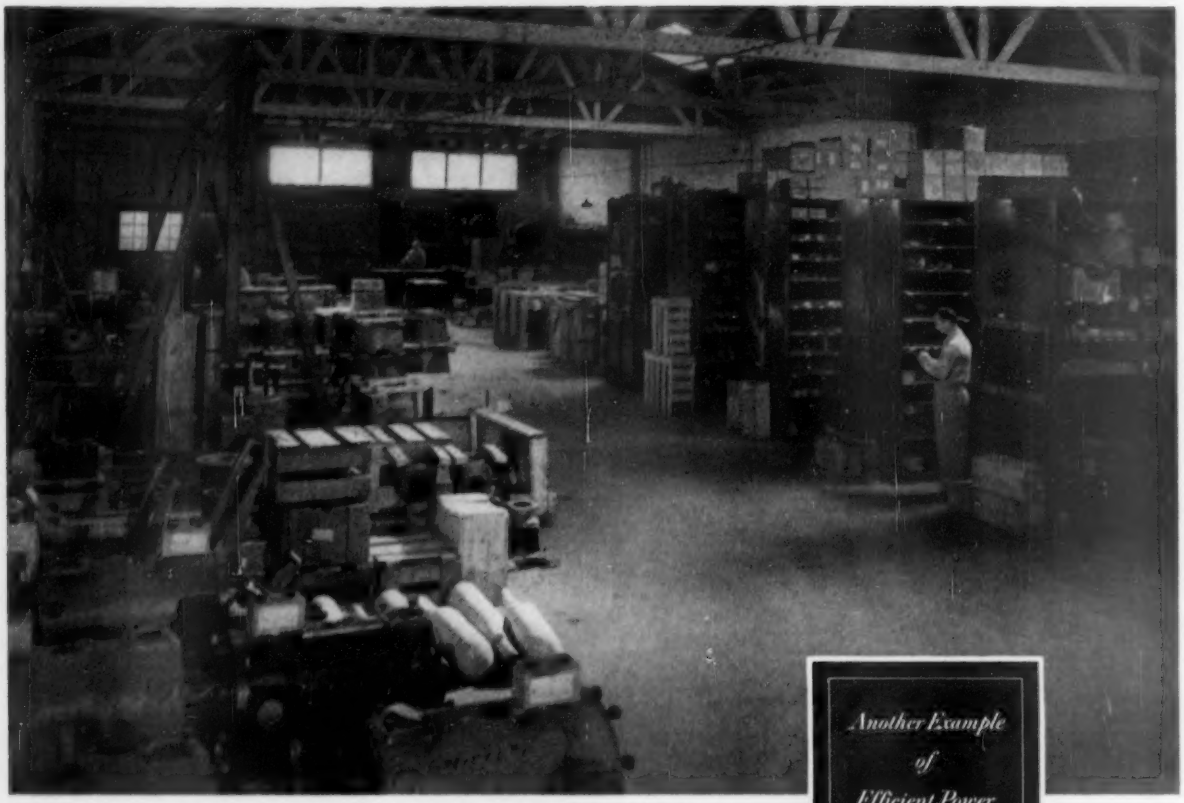
Dual-Matic Combines Reliability, Economy

These flow valve and choke assemblies combine the reliability of true heavy-duty valves with the compactness and economy of unit-valve-and-choke assemblies. The automatic seal is the heart of the flow valve. In tests, the resilient sealing element gave a drop-tight seal even when the floating plug was purposely damaged with a file.

The entire plug, seat, and stem as-



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SERVICE for the life of your engine

When you invest in Cooper-Bessemer engines or compressors, skilled technicians are only as far away as the telephone. It is their job to see that the installation is "right" in every detail . . . . that it continues to operate at top efficiency.

To aid in this program, Cooper-Bessemer has strategically located service warehouses which offer prompt delivery of any needed replacement part. You don't have to stock an expensive or extensive parts inventory, as Cooper-Bessemer factory parts will always be available . . . even if the engine is no longer in production.

Cooper-Bessemer also offers the helpful problem-solving experience of its engineering department and field service engineers as changed conditions or new requirements arise.

If your power problems fall within the 200 to 5000 hp range, reliable Cooper-Bessemer Diesels, gas engines and heavy-duty compressors offer the economical and long-lived answer . . . and with the best of service always at your command.

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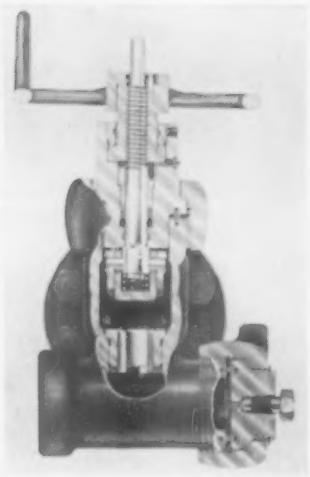

sembly can be replaced without taking the valve off the christmas tree or preventer hookup. In the event of a stem-packing leak, the Chevron packing may be replaced under pressure with the valve in full-open position.

Dual-Matic flow-valve-and-choke assemblies are made in two types: The conventional type to replace the christmas-tree tee as well as the wing-valve-and-choke, and the new straight type which can be attached to the christmas-tree cross or tee. This straight type is ideally adapted for use as a blow-out-preventer valve-and-choke. *Texas Tool & Machine Co.*

Check No. 4 On The Time-Saver Card

●

Jaws of Spin-Torque Chuck Tighten with Torque

The new Spin-Torque chuck has special rocking-wedge jaws which tighten as torque is applied.

A spin of the man-sized hand wheel closes the jaws quickly and smoothly. No hammering is necessary because the jaws pull up tight under normal hand pressure. Diagonal serrations on the jaws eliminate end-thrust slippage and permit either clockwise or counter-clockwise rotation.

What's New... Use the handy Time-Saver Cards

The Spin-Torque chuck clamps rod or bolt stock from ¼ in. up and pipe or conduit from ⅛ to 2 in. The special interlock feature of the jaws enables the chuck to handle such a wide range of sizes.

Jaws are set flush with the face of the chuck to prevent injury to fingers and to allow fitters to thread pipe right up to the face of the chuck itself. *Toledo Pipe Threading Machine Co.*

Check No. 5 On The Time-Saver Card

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Two New Hydra Hooks Added to Complete Line

The addition of two new sizes completes the line of Hydra Hooks. Now there are seven different sizes having respective capacities of 40, 65, 100, 150, 250, 350 and 450 tons. The adjoining illustration shows the comparative size of the 40-ton tubing hook and the 450-ton giant for the deepest wells to be drilled.

For conservation of working space

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Recognized throughout the world as superior to all other natural clays used in adsorption processes, Florex is particularly effective in the adsorptive refining, decolorization, clarification and neutralization of mineral, vegetable, and animal oils, fats and waxes. Florex is also effectively used for sweetening light distillates, dehydration, desulfurization and polymerization.

Florex is prepared from carefully selected natural Florida Fullers Earth by a special processing including high-pressure extrusion, which greatly improves adsorptive efficiency and capacity.

Standard particle sizes are herein reproduced and include meshes from 2/4 to 200/ up. Special meshes are also available. Florex is packaged to fulfill customer's requirements with the Fifty (50) pound non-returnable paper bag the minimum quantity.

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4/8
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Please send literature ☐ and sample ☐ of Florex
(Be sure to indicate mesh size_____)

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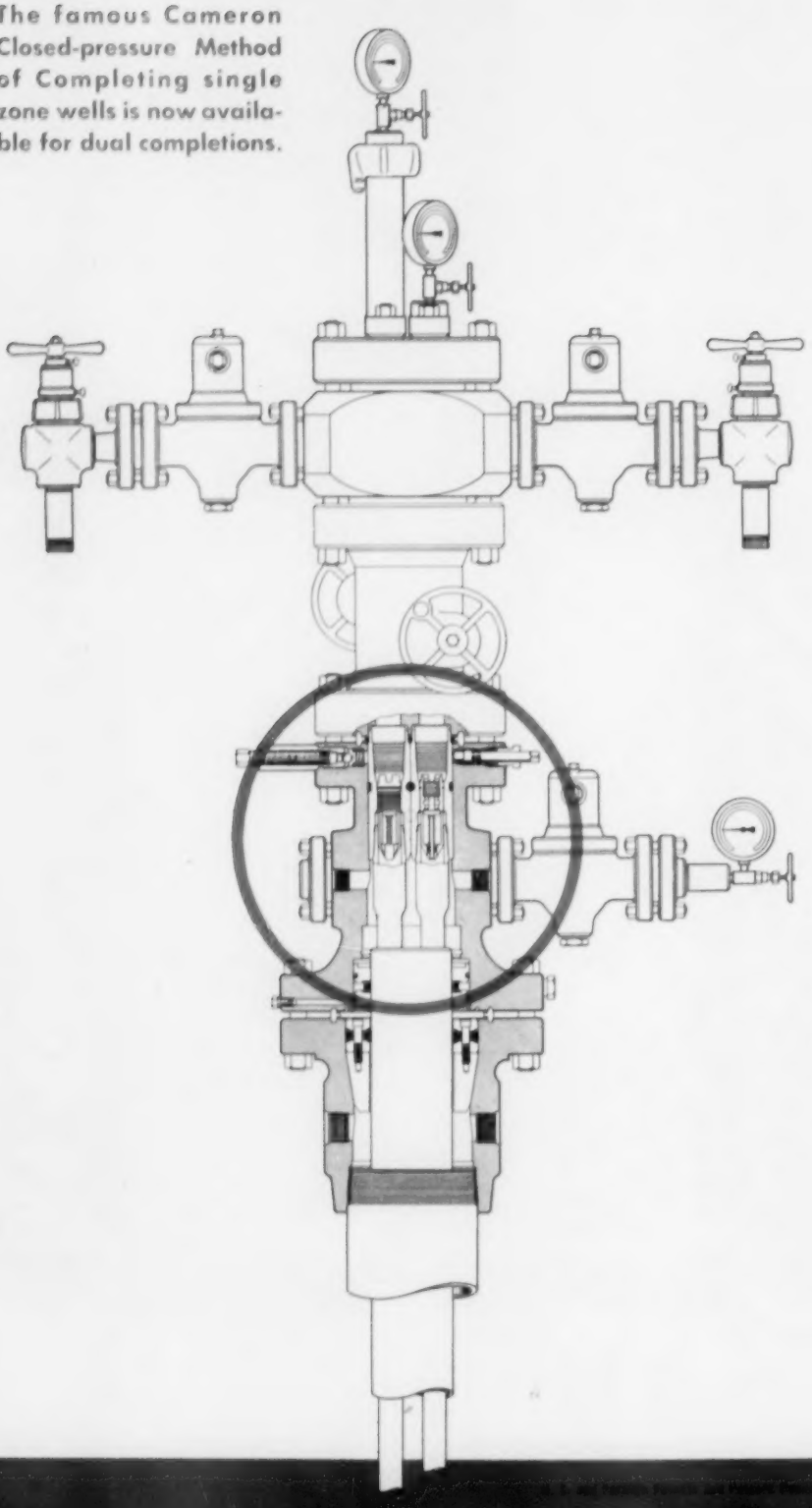
The famous Cameron Closed-pressure Method of Completing single zone wells is now available for dual completions.



PROVEN PERFORMANCE

COMPACT COMPONENTS

WORK TUBING STRINGS INDEPENDENTLY

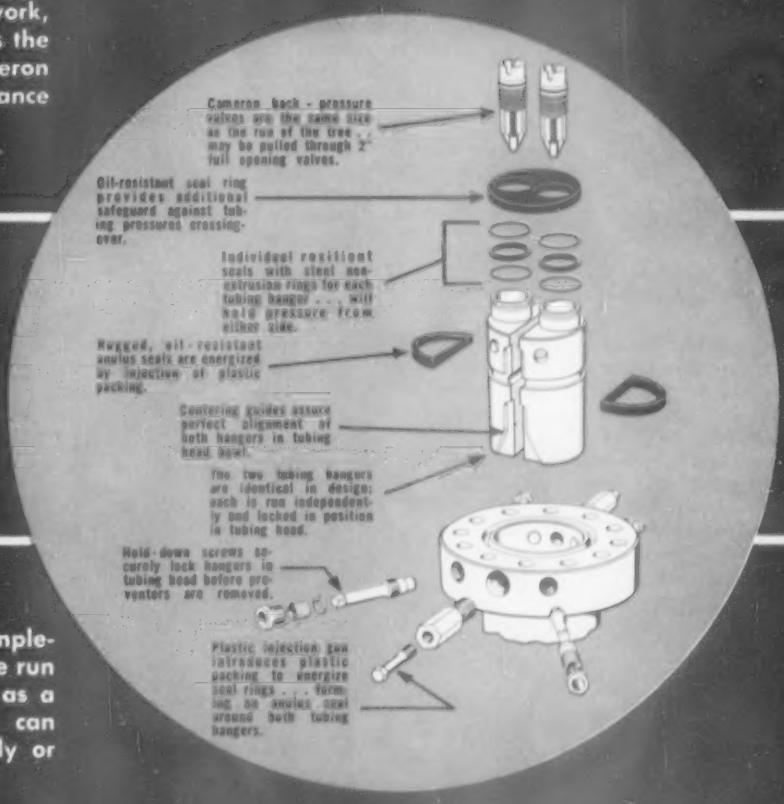
COMPLETE CONTROL

CAMERON "DC"
DUAL COMPLETION TREE

Cameron field men, with many years experience in well completion work, including dual completions, plus the proven performance of Cameron "DC" equipment, is your assurance of a job well done.

Note in the accompanying illustrations that the Cameron "DC" equipment is almost as compact as regular one-zone completion equipment. Two strings of $2\frac{1}{8}$" OD upset tubing may be run in 7" OD casing with 6" heads.

In the Cameron "DC" Dual Completion Method, either string can be run in precisely the same manner as a single zone completion—they can be run or pulled independently or simultaneously.


Cameron back - pressure valves are the same size as the run of the tree . . . may be pulled through 2" full opening valves.
Oil-resistant seal ring provides additional safeguard against tubing pressures crossing-over.
Individual resilient seals with steel non-extrusion rings for each tubing hanger . . . will hold pressure from either side.
Rugged, oil-resistant annulus seals are energized by injection of plastic packing.
Centering guides assure perfect alignment of both hangers in tubing head bowl.
The two tubing hangers are identical in design; each is run independently and locked in position in tubing head.
Hold-down screws securely lock hangers in tubing head before preventers are removed.
Plastic injection gun introduces plastic packing to energize seal rings . . . forming an annulus seal around both tubing hangers.

At no time during completion operations does the Cameron "DC" equipment leave the well open. A standard Cameron QRC Blowout Preventer with special off-center rams provides complete protection during the initial phase of the completion. The reliable Cameron Back Pressure Valve is provided to safeguard against loss of control thru the tubing string.

Each tubing string is suspended, locked securely in the tubing head, and sealed before preventers are removed. The tree may then be installed and flowline connections made before removing the back-pressure valves and washing the well into production.

Cameron
IRON WORKS, INC.
P. O. Box 1212, Houston, Texas
Export Office: 7912 Empire State Bldg., New York City. In England: British Oilfield Equipment Co., Ltd., Time & Life Bldg., New Bond Street, London W. 1 England.

What's New... Use the handy Time-Saver Cards

in the derrick, Hydra Hooks (with the top bail removed) are being direct-connected with practically all standard makes of traveling blocks. And, for the ultimate in a short close-coupled hook - block combination, Bethlehem Supply Co., Emsco Manufacturing Co., McKissick Products Corp., and Unit Rig & Equipment Co. have designed their new lines of traveling blocks to be unitized with Hydra Hooks. *Web Wilson Oil Tools, Inc.*

Check No. 6 On The Time-Saver Card

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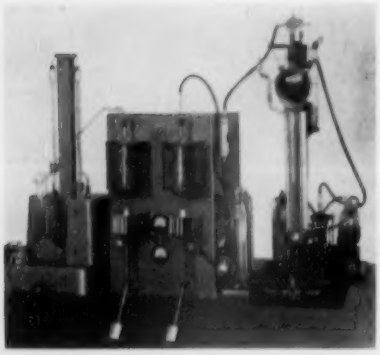

Leco High-Frequency Method Speeds Sulfur Analysis

The Leco high-frequency combustion titration procedure is an empirical method for the rapid analysis of sulfur in oil or oil additives. Analysis time is 3 to 10 minutes depending on the type material tested. Results are generally in excellent agreement with the usually employed analysis procedures. The sample is kept from exploding by an igniter which immediately burns all volatile matter.

Additional advantages to the method are those attributable to using an induction furnace and automatic titrator. An induction furnace need consume power only while it is actually combusting a sample, is ready for use only 45 seconds after turning on the switch, is cool in operation, and can be turned off immediately in case of dangerous hydrocarbon saturation of the atmosphere in a refinery.

The automatic sulfur titrator leaves the operator free to conduct other analyses during the combustion period and is more accurate because there is no question of over or under titrating. *Laboratory Equipment Corp.*

Check No. 7 On The Time-Saver Card

●

Air-Cooled Engines Range From 20 to 70 Hp.

A complete new line of air-cooled, valve-in-head industrial engines ranges from 20 to 75 hp. The new family of engines includes two—cylinder vertical, opposed 4's and V-4's. The first of these, the C2-90, is already in production.

The Model C2-90 is a two-cylinder, vertical, valve-in-head engine that develops 30 hp. at 3,000 r.p.m. It employs a full-pressure lubricating system, a double-row ball-thrust bearing for pump and other applications, replaceable copper-lead connecting-rod-bearing inserts, crankshaft extensions to fit customer requirements, and stellite valves and valve-seat inserts.

Base mounting dimensions, shaft dimensions, and mounting bracket dimensions are interchangeable with other major air-cooled engine units. Valve-in-head design with aircraft-engine-type finning provides adequate valve cooling in high operating temperatures.

The C2-90 engine will provide 1,000 hours continuous duty without overhaul, and has the highest horsepower and torque per cubic inch displacement in the air-cooled field. The unit is an all-weather performer. *Lycoming Division, Avco Manufacturing Corp.*

Check No. 8 On The Time-Saver Card

●

Nu-Coil Scratcher Is Made With 3-in. Wires

To remove the mud cake from permeable formations and to properly condition the hole for cement placement in holes of restricted clearance, Nu - Coil - type rotating scratchers, with 3-in. wires are assembled on a base plate. The plate lays flat on the casing and conforms to the casing curvature. The base plate is heavy enough to permit fast tack welding to the casing on the rack or at the rotary table as casing is run. Installations of Nu-Coil-type rotating scratchers have been successfully run on 5-in. liners in 6⅛-in. hole, on 5½-in. oil strings in 6¼-in. hole, and on 7-in. casing in 8⅜-in. hole. Slip-on centralizers used on rotating jobs, with restricted clearances, are installed on the casing joint and not over the casing coupling. They are mounted for rotation between stops and should not be welded to the casing. *B & W, Inc.*

Check No. 9 On The Time-Saver Card

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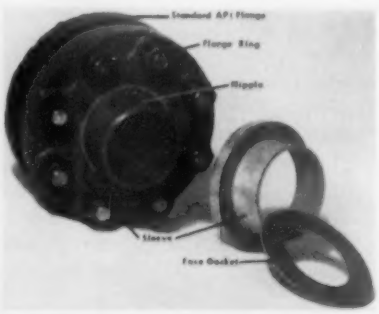
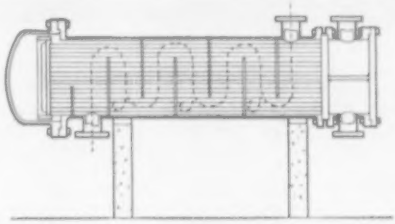


Insulated Flange Protects Against Galvanic Action

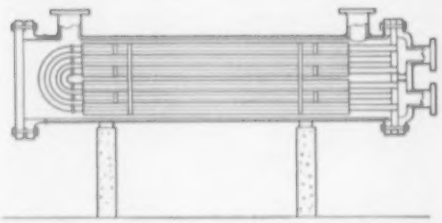
The Tudor insulated flange provides protection against the flow of galvanic and stray electrical currents in flow

BROWN FINTUBE'S

BETTER DESIGN MEANS BETTER PERFORMANCE



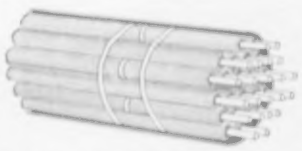
● Sectional View of Conventional Bare Tube Heat Exchanger Showing the Transverse Baffles that require the flow to make a series of 180° Bends, Resulting in Substantial Pressure Drop; Adding Unnecessarily to Pumping Costs; and producing Back Eddies, where Entrained Solids can Settle Out, Further Reducing the Heat Transfer Efficiency, and Increasing Cleaning and Maintenance Costs.



● Sectional View of Brown Fintube Bundle Exchanger. Fluid Flows through Hundreds of Long, Straight, Narrow Passages in Intimate Contact with the Heat Transfer Surface. The Only Pressure Drop Occurring Results from the Impingement of Flow Against the Heat Transfer Surface, and the Bends as the Fluid Enters and Leaves the Unit, Minimizing Pumping Costs, also Cleaning and Maintenance.

BROWN FINTUBE'S DESIGN ELIMINATES BAFFLES

Minimizing Pressure Drop



● View Showing the Banding of Alternate Fintubes to Prevent "Nesting", and Outer Bands that Produce a Tight, Compact Bundle of Long, Narrow, Straight Passages.

● The "bundle" in a Brown Fintube Exchanger consists of our integral "one-piece" fintubes connected with return bends; the other ends rolled into a tube sheet. A metal band strapped around each alternate fintube prevents "nesting", and the entire assembly is then banded tightly together.

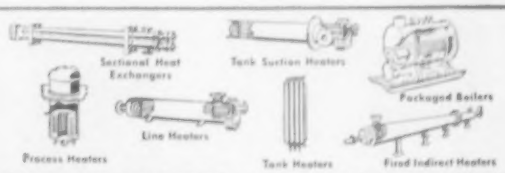
This construction produces hundreds of long, narrow, straight passages, through which the fluid flows. Carefully controlled velocities develop a turbulent flow, keeping heat transfer coefficients in a desirable range. There are no baffles, as when bare tubes are used, with their 180° bends to cause pressure drop, and create back eddies where entrained solids can settle out. In Brown Fintube exchangers, pressure drop results *only*, from the impingement of the fluid against the heat transfer surface, and the bends entering and leaving the unit.

The "one-piece" fintubes, available in carbon steel, alloy or non-ferrous metals, have 6 or 8 times more surface than plain bare tubing. They transfer more heat per lineal foot than plain bare tubing, saving space and weight;—and at lower temperatures per square foot of surface, preventing damage to heat sensitive materials.

Write for Bulletin No. 521. It lists dimensions and capacities of standard sizes. Other sizes and designs to meet any requirement. Write for your copy of Bulletin No. 521 *today!*

BROWN FINTUBE CO.

365 HURON ST., *Elyria, Ohio*



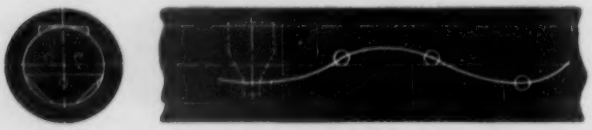
Engineering and Sales Representatives: NEW YORK • BOSTON • PHILADELPHIA • PITTSBURGH • BUFFALO • CLEVELAND • CINCINNATI DETROIT • CHICAGO • ST. PAUL • ST. LOUIS • KANSAS CITY • MEMPHIS • BIRMINGHAM • NEW ORLEANS • SHREVEPORT • TULSA • HOUSTON • DALLAS DENVER • LOS ANGELES AND SAN FRANCISCO ● *Licensed Manufacturers:* BROWN FINTUBE (CANADA) LTD., ST. THOMAS, ONTARIO, CANADA BROWN FINTUBE (GREAT BRITAIN) LTD., BIRMINGHAM, ENGLAND • FRIEDRICH UHDE, GMBH, DORTMUND, GERMANY

WESTERN'S NEW ROCKET JET GUN...

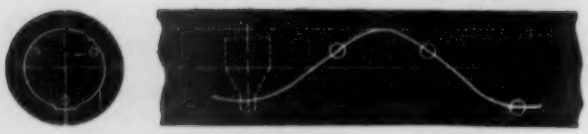
here's the how...

New WESTERN ROCKET Jet perforating principle through use of spring device in charge positioning brings you more effective application of jet force to target.

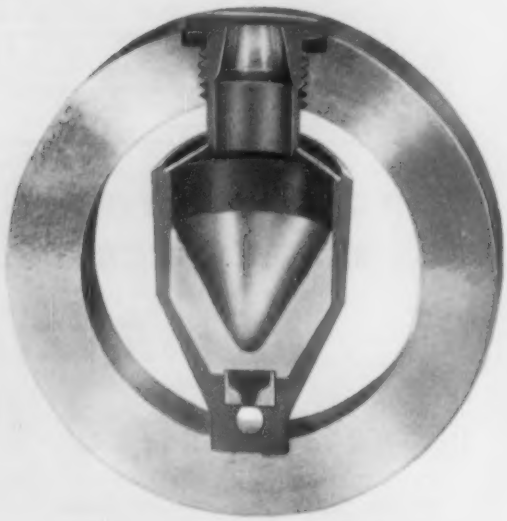
By shortening prima cord length as shown in "A" below, charge-to-charge interference has been eliminated thus allowing use of a larger charge for more effective jet perforating.



(A) ROCKET JET GUN



(B) STANDARD JET GUN



STANDARD JET GUN

Western's new engineering principle of charge positioning* in tubular jet guns brings you three major perforating advantages:

1. WESTERN ROCKET Jet Gun through charge placement provides more effective use of jet force.
2. WESTERN ROCKET Jet Gun through shortening of prima cord allows use of larger charge than standard.
3. WESTERN ROCKET Jet Gun provides superior perforating effectiveness with sureness of penetration and safety provided only by retrievable guns.

Taken all together, WESTERN ROCKET Jet advantages add up to this—186% larger entry hole . . . 50% greater excavation . . . 10% deeper penetration. Ask your nearest WESTERN engineer for complete data on this significant new advancement in jet perforating and learn how you can get finer, more effective perforating . . . ROCKET JET PERFORATING . . . at no extra cost!

ANOTHER "FIRST" FROM WESTERN RESEARCH

THE WESTERN COMPANY

General Offices: MIDLAND, TEXAS

ACIDIZING • FRACTURING • PERFORATING Jet & Bullet
GAMMATRON Radioactivity Well Logging

* PAT. PENDING

TEXAS: Ballinger; Borger; Levelland; Odessa; Seagraves; Snyder • OKLAHOMA: Cushing; Healdton • NEW MEXICO: Hobbs • KANSAS: Ulysses

lines by electrically isolating the line sections. Protection is provided by an insulated joint which incorporates mechanical strength with the excellent properties of Formica insulation.

An insulated flange assembly consists of a standard A.P.I. forged-steel flange plus a Tudor insulated flange of the welding-neck, slip-on, or threaded type. These two flanges are electrically isolated by a neoprene-faced phenolic gasket and an insulating sleeve. The combination results in full isolation of the flanges regardless of foreign matter which may become lodged between the flange faces. The extension of the sleeve beyond the flange ring into the flange separation space and along the skirt of the nipple maintains space, and that along the skirt of the nipple maintains the electrical isolation between flanges.

The insulation material in both the face gasket and the sleeve is a fabric-base, phenolic laminate with a high degree of dimensional stability, mechanical strength, and moisture resistance. *Paramount Equipment Co., Inc.*

Check No. 10 On The Time-Saver Card

Hydramotor Valve Developed For Oil Lease Operations

A new series of valves that meet the special requirements of automatic oil-lease operation are included in the company's newly developed "H" series Hydramotor valves.

Utilizing the powerful electrohydraulic principle of operation, the electrical power required during the 12 to 23-second opening cycle is only 80-volt amp. The valve is held in the open position with only 9-volt amp.

What's New... Use the handy Time-Saver Cards

Hydramotor valves open against a heavy return spring that provides an important fail-safe feature. With any power interruption, the valve automatically goes to the normal deenergized position.

Standard valves for automatic oil-lease operation are made in sizes from 1 to 3-in. pipe, handling maximum pressure ranging from 50 to 400 psi. They are available in 115/60 and 230/60 voltages. The two-wire electrical circuit permits low-cost installation for remote operation with instantaneous response.

Other features of particular value in oil-field applications include: a weatherproof, explosionproof actuator housing; a gland compartment dust shield to protect the stem yet permit visual inspection of packing; spring-loaded Teflon stem packing for tight seal without adjustment; and single-seated valve construction with stainless-steel trim and Buna-N disk. *General Controls Co.*

Check No. 11 On The Time-Saver Card

You defy the elements with R & M "All-Weather" motors

Rain and sleet are no match for the famous Robbins & Myers "All-Weather" oil country motors. All steel parts are specially treated against rust and corrosion. The rotor assembly is sprayed with rust inhibitor. Cast-iron parts are given a zinc chromate and iron oxide primer.

The terminal box is gasketed, and leads are sealed at the shell with a non-hardening compound. Nothing is overlooked or taken for granted. The R & M "All-Weather" motor is truly built to withstand the elements. That's why it has such a wonderful reputation among oil men.

This is only one of the outstanding features you'll like when you specify Robbins & Myers motors. Others include:

Extra-large, pre-lubricated ball bearings, sealed to keep grease in, dirt out.

Clean-sweep ventilation, to keep motor cool and clean.

Screened openings, to keep out rodents and debris.

Available in triple-rated, high-slip, and high-torque designs.

Even with all these features, R & M motors are sold at a standard motor price. Available in single-phase, 1 to 15 HP; open-protected polyphase, 1 to 200 HP; totally enclosed, 1 to 40 HP. Write Dept. OG for our free bulletin on Oil Field Motors and the name of your nearest R & M representative.

R&M "All-Weather" Oil Country MOTORS

ROBBINS & MYERS, Inc.
Springfield, Ohio • Brantford, Ontario

"All-Weather" is an R & M trademark

This 6-stage Goulds Fig. 3360 centrifugal pump is in daily service in Overton, Tex., for the Bell General Pipe Line Company. It handles 22,500 barrels of crude daily, at 465 lbs. pressure. It has been in continuous service for 5 years.

Pipeline profits start here

You have to keep oil flowing through the lines *all the time—at full capacity*—to keep them paying their way.

That means that your pumps must stay on the job day in and day out, pushing the petroleum along with maximum efficiency. Down time for maintenance and repairs is a costly leak through which your profits trickle away.

That's why it will pay you to specify Goulds pumps for your pipelines.

They're designed to give you the best pumping performance you can buy, and they're ruggedly built to give you long, trouble-free service.

The Goulds line of pumps is complete, and you can obtain just the pumps you need for your capacity and pressure requirements. Special alloys, too, if you need them. Your Goulds representative will be glad to help you select the Goulds pumps to meet your needs, or write direct to our main office. Your inquiry will receive prompt attention.

MEMBER

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Pittsburgh • Tulsa

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Vari-Pitch Sheave Bulletin. Bulletin 20B6082C describes stationary and motion-control Vari-Pitch sheaves for speed variations up to 76 per cent by means of pitch-diameter adjustment. The sheaves are available in capacities from 1 to 600 hp. Where speed changes are infrequent and the machine can be stopped, the change can be effected in a few minutes by using the stationary-control-type Vari-Pitch sheave. Where frequent speed changes must be made while the sheaves are moving, the motion-control Vari-Pitch sheave provides positive automatic speed changes at a turn of a handwheel. *Allis-Chalmers Manufacturing Co.*

Check No. 12 On The Time-Saver Card

■

Nordberg Supairthermal Engine - Gear Set, a new eight-page bulletin No. 237, describes the advantages of the Supairthermal V-type engine-gear set for operation on large-capacity gas pipelines. For example, the Supairthermal engine driving a centrifugal gas compressor through a speed-increasing gear can save thousands of dollars in fuel costs. Such performance is possible because of the design principles which permit a thermal efficiency of better than 40 per cent, with increased horsepower, lower lube-oil consumption, and lower maintenance costs per horsepower hour. *Nordberg Manufacturing Co.*

Check No. 13 On The Time-Saver Card

■

Dimetcote Technical Bulletin outlines a method by which a painter can cold-galvanize any steel surface with Dimetcote, a 10 per cent inorganic zinc coating, with either spray equipment or brush. When Dimetcote is applied to steel, a reaction takes place at the surface which produces chemical bonding and physical adhesion. *Amercoat Corp.*

Check No. 14 On The Time-Saver Card

■

U. S. Totally Enclosed and Explosion-proof Motors. A completely new serries of U. S. totally enclosed and explosion-proof motors are detailed in a bulletin, No. 1879. Designated as Types J and E, these motors are an advanced con-

cept of complete protection against atmospheric hazards. A colored cross-section of the Type J motor with fan is shown, with callouts pointing out the many construction benefits. Photographs and drawings graphically illustrate such features as the prewound stator core, asbestos-protected windings, and Lubriflush lubrication. *U. S. Electric Motors, Inc.*

Check No. 15 On The Time-Saver Card

●

UD-1091 Diesel Engine. An eight-page booklet describes the UD-1091 power unit. The UD-1091 is the largest diesel model in International's line of 18 heavy-duty power units. The six-cylinder, valve-in-head engine develops 190 hp. at 1,400 r.p.m. Featuring heavy-duty construction, the unit has a counterbalanced crankshaft, seven precision replaceable bearings, replaceable hardened cylinder sleeves; and chrome-plated top piston rings. The new booklet contains full specifications, photographs, and performance charts on the UD-1091 as well as descriptions of available attachments. *International Harvester Co.*

Check No. 16 On The Time-Saver Card

●

Modern Filtration, Sintered bronze, a relatively new filter material gaining wide acceptance in petroleum and natural-gas processing, is thoroughly covered for the industry in a new catalog. The catalog describes how millions of microscopic bronze balls are fuzed togethed to form a reusable filter virtually unaffected by temperature extremes. It includes basic information on the advantages of porous bronze as a filtering medium, and engineering data on filters already being produced. *Permanent Filter Corp.*

Check No. 17 On The Time-Saver Card

●

ACF Lube Manual covers lubricants for ACF plug valves. The booklet is well illustrated with cross-sectional views of ACF valves and goes into considerable detail regarding construction. *ACF Industries, Inc.*

Check No. 18 On The Time-Saver Card

●

The Chemical, Insulating, and Associated Companies. This brochure gives an insight into the fields of activity in chemical and thermal insulation, provides a background of technical and statistical information, and summarizes the services available to industry. Materials include 85 per cent magnesia, dextramite, metadextramite, insulating concrete, and armouring compound A.C.I. Forms include preformed pipe sections, slabs, bulk, boxes, pads, and mats. *The Darlington Insulation, Co., Ltd.*

Check No. 19 On The Time-Saver Card

●

Oil and Gas Separators—High-Pressure, Horizontal Type. These discount sheets comprise a catalog section covering horizontal high-pressure oil and gas separators. Included are illustrations, specifications, price list, and field-service charges. *Sivalls Tanks, Inc.*

Check No. 20 On The Time-Saver Card

●

National Adjustable Chokes, in a full range of sizes of flanged and screwed connections, are described in Bulletin 442. Types F, G, and GR, with working pressures of 2,000 to 10,000 psi, are included in the four-page bulletin. *National Supply Co.*

Check No. 21 On The Time-Saver Card

●

Infrared Analyzer Type 38-101. Bulletin CEC 1840-X4 covers equipment that handles up to five streams at a rate of five analyses per hour per stream, i.e. a 12-minute cycle period. The analyzer increases fractionator capacity by holding product composition steady and minimizing operational fluctuations. *Consolidated Engineering Corp.*

Check No. 22 On The Time-Saver Card

●

Industrial Controls Catalog. The most complete catalog ever published by the firm, this covers a broad line of automatic industrial controls including temperature, level, pressure, and flow controls. This new catalog groups products in such a way that all information needed about each item is readily avail-

VICTOR ALLOY STUDS

Serving the Industry

Victor's long experience in meeting industry specifications for alloy fastenings is your guarantee of dependable performance from VICTOR alloy studs.

Write for the new VICTOR catalog.

VICTOR PRODUCTS CORP.

7635 W BELMONT AVE • CHICAGO 18 ILL

For Safety Unsurpassed

KELCO *Safety* SPINNING LINE and BREAKOUT CATHEADS

The Model 16-LH Non-Fouling Cathead

THE OUTSTANDING CATHEAD OF TODAY AND TOMORROW

Anti-Fouling Catline Spool
Completely Housed Friction Cathead
Simplicity of Design, Operation and Maintenance
Double-Plate Clutch
Anti-Friction Bearings Throughout as Recommended by Leading Bearing Manufacturers
Choice of Mechanical, Hydraulic or Air Controls

AVAILABLE THROUGH YOUR FAVORITE SUPPLY STORE

Representatives in All Fields

Be Safety Wise — KelCo-ize

KELCO BEN F. KELLEY CO., Inc.
TULSA, OKLAHOMA

SPINNING LINE CATHEADS • BREAKOUT CATHEADS • AIR OPERATED POWER SLIPS
TUBING TONGS • SAFETY "C" POLISHED ROD CLAMPS

able. It covers electrically operated valves for gas, air, oil, water, steam, and other fluids in various applications. *General Controls Co.*

Check No. 23 On The Time-Saver Card

●

Chemical Plants Division. Complete engineering and construction services available are explained in new bulletin, No. 2505, just issued. The bulletin outlines chemical plants division services from preliminary surveys to initial operation of process plants. In addition to the field of general chemicals, the chemical plants division specializes in resins and plastics, chlorine and alkalies, petroleum and petrochemicals, fertilizers, low-temperature processes, synthetic fuels, and special nuclear-development work. *Blaw-Knox Co.*

Check No. 24 On The Time-Saver Card

●

Pulsation Dampeners and Shock Arrestors. Bulletin 55-1 illustrates the advantages of pulsation and shock control used in the drilling industry on pipeline installations and on cementing trucks. Engineering data includes specifications, recommendation charts, dimensional drawings, and a list of supply points. *Gadco Products, Inc.*

Check No. 25 On The Time-Saver Card

●

What's New in International Crawler Tractors and Equipment. This 30-page illustrated booklet lists recent improvements that have been made in TD-24, TD-18A, TD-14A, TD-9, TD-6, and T-6 crawlers. It devotes extra space to a description of the new TD-24 torque-converter diesel crawler. In addition, the booklet lists and pictures new International equipment that has been added recently to round out the IH line. *International Harvester Co.*

Check No. 26 On The Time-Saver Card

●

Baroid Distributors. This new bulletin is a complete directory of stock points of Baroid products in the United States and Canada. Opposite each page of listings is an area map pin-pointing stock locations in oil country. *Baroid Division, National Lead Co.*

Check No. 27 On The Time-Saver Card

●

The Caterpillar D-9, considered the world's largest and most powerful tractor, has recently been announced. A new booklet, Form-31555, lists the salient features of the new tractor and pictures the tractor, engine, and turbocharger, plus brief specifications. *Caterpillar Tractor Co.*

Check No. 28 On The Time-Saver Card

●

Electric Motors. A new 8-page catalog, SDA-155, describing a line of ½ to 30 hp., single phase, polyphase, and d.c. motors is now available, giving information on how to select the proper motor; things that should be known about the motors you require; standards and specifications to which Peerless builds; enclosures; special mountings and modifications; data on fractional and integral-horsepower frame sizes; and a listing of sales and service offices. *Peerless Electric Co.*

Check No. 29 On The Time-Saver Card

●

Philadelphia Gear Manual. The completely new manual, Catalog G-655, includes 76 pages of illustrations, diagrams, definitions, tables, charts and explanations regarding all types of gears. There is also presented a simplified method of calculating horsepower ratings of all types of gearing. *Philadelphia Gear Works.*

Check No. 30 On The Time-Saver Card

DAVY CROCKETT
Pioneering made him FAMOUS
Legends of Davey Crockett's bold pioneering exploits and his continual fight for a great country made him famous. Enardo pioneered the vapor control system in the oil industry, and today they are moving forward through advanced engineering to bring you even greater products. Insist on Enardo products for the best in modern equipment, backed by years of experience.
Enardo Slip-On fittings can be used on plain end pipe for connections with pressures to 125 P.S.I. No threads or grooves are required, and pipe can be connected or disconnected in less than one-third the time required for threaded connections.
ENARDO
ENARDO
"SLIP-ON" PIPE FITTINGS
ENARDO manufacturing company
BOX 1647 • TULSA, OKLAHOMA

they never get tired!
• YARWAY Single-end Welding-type Gun-Pakt joint for 150 lbs. pressure.
• Some of the 189 YARWAY Gun-Pakt expansion joints installed at large oil refinery in Texas.

No fatigue with 189 YARWAY GUN-PAKT EXPANSION JOINTS at this large Texas refinery

THEY just work and work for years and never get tired. Yarway Gun-Pakt slip-type joints simply will not fail through fatigue. They will operate smoothly, as frequently as required, over long, full traverse up to 12" single type or 24" double type or short, partial traverse, day in and day out—with never any danger of metal fatigue or failure.

This is just one of the many big advantages found in Yarway Gun-Pakt expansion joints. Other outstanding Gun-Pakt features are:

1. Can be serviced under *full* steam pressure day and night, thus avoiding costly and inconvenient shutdowns.
2. Fixed Gun-Pakt gland serves as "built in" external guide and permits less costly and rigid pipe guidance than required by many other types of joints.
3. Lower pressure load on end anchors because excessive strains are eliminated.

Used for many years with success in well-known refineries, industrial plants, utilities and institutions. When replacing present joints or planning new steam lines, it will pay you to look into the advantages of the Yarway Gun-Pakt expansion joint. Write for Yarway Bulletin EJ-1913.

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136 Mermaid Avenue, Phila. 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY

gun-pakt expansion joints

EQUIPMENT MEN . . . in the News

Otis Branch Officials Meet in Dallas

Field officials and the managers of Otis Pressure Control, Inc. met at the firm's general offices to review recent developments on a new casing-nipple packer which Otis has just marketed. Shown in the company's conference room are (seated): W. K. (Jug) Waters, division manager, Corpus Christi; K. W. Robbins, service manager, Dallas; Herbert C. Otis, Jr., executive vice president, Dallas; L. M. Wilhoit, vice president for sales and service, Dallas; E. A. Kelley, manager, permanent well completion department, Houston. (Standing): T. G. Garwood, sales manager, Dallas; W. M. Kelly, division manager, Houston; Harry Wycoff, tubing manager, Houston; Dick S. Simon, division manager, Longview; Bill Mitchell, division manager, Odessa; Bob Crain, division manager, Oklahoma City; Kebbie Turner, field engineer for Otis Engineering Corp., an affiliated firm, Dallas; and Bill Hill, division manager, New Iberia.

G. S. I. Makes Vetter Vice President

The appointment of E. O. Vetter to the position of vice president, administration, has been announced by the board of directors of Geophysical Service, Inc.

Vetter was formerly assistant vice president in charge of of the administrative division of the Dallas geophysical-contracting firm. Vetter joined G.S.I. as controller in 1952. Prior to that he served as assistant manager of the organization and cost-control division of Standard Oil Co. of California.

McKenzie to Head Homco's New Office at Calgary

Houston Oil Field Material Co. has announced the opening of a new directional - drilling and oil - well surveying office in Calgary, Alta., Canada.

The office will be under the direction of Thomas A. McKenzie. McKenzie, prior to his association with Homco, was general manager for Eastern Oil Well Surveying Co., Ltd., in Calgary. His background before that included experience as a drilling engineer for Shell in Venezuela, and as a drilling and a drilling-mud engineer in Trinidad.

Clark Joins Page Oil Tool as Chief Engineer

R. D. CLARK

Robert Duff Clark has joined Page Oil Tools, Inc., as chief engineer of the Long Beach, Calif., plant, according to an announcement made by John Page, president. Formerly a development engineer in the research and process department of Union Oil Co. of California, Clark received his education at Stanford University and California Institute of Technology.

Stewart & Stevenson Announces Promotions

Promotions in the Houston headquarters of Stewart & Stevenson Services have been announced by Joe Manning, vice president and general manager.

Fred E. Mitchell has been promoted from service manager to coordinator of service. G. B. Shandley, formerly assistant to the service manager, will succeed Mitchell. Paul Seward has been named application engineer.

Mitchell has been in charge of service since Stewart & Stevenson entered the diesel-engine industry. He has been responsible for a number of major Stewart & Stevenson service policies, including remanufactured engine exchanges and flat - rate zone service charges.

Shandley has been with Stewart & Stevenson since 1944. He has been in charge of the customer-service training program and the Stewart & Stevenson school for diesel-engine engineers.

Seward has 18 years' experience with the Electromotive Division of General Motors Corp. He will join Stewart & Stevenson's service and engineering departments.

Houston Nomads Entertain Foreign Guests

Foreign guests, shown with a group of members, at the May meeting of the Houston Nomads were, front row: John F. Foster, R. J. S. Germain, Houston; W. T. Short, Brazos Oil & Gas Co., Houston; J. G. Youngblood, Texas Petroleum Co., Bogota, Colombia; J. A. Wirtensohn, Asiatic Petroleum Co., Houston; and E. F. Hulsman, Shell of Colombia, Bogota, Colombia.

In the back row are: M. L. Delano, Export Representative, New York; Del Redding, Phillips Petroleum Co., Houston; R. L. Foster, Socony-Mobil, New York, and R. F. (Bob) Smith, Oil Operator, Houston.

Happy Co. Shifts Allan to Fort Worth

EDGAR ALLAN

Edgar Allan, city sales engineer for Happy Co. in Tulsa, has been transferred to Fort Worth to head the company's sales in the Fort Worth-Dallas - Shreveport district.

He replaces Charles C. Stanley, who was transferred to Tulsa as city salesman and assistant to Leo King, president of the firm. Happy Co. manufactures and distributes oil-field equipment and accessories.

Foxboro Establishes Ten Regional Sales Divisions

Intensifying its instrument sales-engineering coverage, Foxboro Co., of Foxboro, Mass., has established 10 regional sales divisions with territories arranged for maximum service to industrial instrument users. Administered by H. O. Ehrisman, newly appointed general sales manager, and J. J. Burnett, field sales manager, the new regional organization will permit full utilization of the company's 48 branch offices in serving the needs of industry.

The 10 regional sales offices and regional managers are: New England, H. H. Michelmore; New York, E. R. Huckman; Philadelphia, J. B. Deaderick; Pittsburgh, A. H. Shafer; Atlanta, E. W. Prendergast; Cleveland, H. L. Lee; Chicago, J. J. Connelly; Dallas, E. L. Stark; Houston, L. W. Parten; and San Francisco, R. E. Rogers.

Rolo Export Representative Inspects New Wellchecker

Maurice F. Delano, vice president in charge of international oil-industry sales for R. S. Stokvis & Sons, Inc., New York export representatives for Rolo Manufacturing Co., and Pat A. Clower, Rolo sales engineer, Houston, inspect the new Rolo Model RM-18-2400-24 Wellchecker, with Rolocheck meter. This new 125-psi. unit is designed especially for normal producing wells wth low gas-oil ratios.

Victoria Bank Official Flies Cessna

Victoria Bank and Trust Co., Victoria, Tex., recently purchased this new Cessna 170 aircraft to permit a wider range of operations and faster loan approvals for Roger C. Hamel, Jr., Victoria Bank and Trust vice president, who directs the oil and gas department. He is shown on the right with David R. Blackburn, senior vice president of the bank. Hamel is a licensed pilot and a veteran of the United States Air Force.

Brown Fintube Names Benson, Funk as Representatives

Brown Fintube Co., Elyria, Ohio, manufacturers of heat exchangers and other fintube heat-transfer products, has announced the appointment of the recently formed firm of Benson, Funk, & Associates as sales and engineering representatives for the New England territory.

Walter L. Benson, mechanical engineer, was formerly with Container Corp. of America, Hartford Steam Boiler Inspection, Rohm & Haas, and more recently has been engineering vice president of Process Engineering, Inc. William R. Funk, Jr., an electrical engineer, has been with Mueller Furnace, Automatic Electric, Cook Electric, and more recently has been sales vice president of Process Engineering, Inc.

W. L. BENSON

W. R. FUNK, JR.

Wolverine Completes Seminar on Trufin

A 2-day seminar entitled Opportunity and devoted to Wolverine Trufin, the integral finned condenser tube, was conducted by Dr. Donald L. Katz, professor of chemical engineering on the faculty of the University of Michigan, announced G. H. Tobelman, eastern district sales manager for Wolverine Tube, Division of Calumet & Hecla, Inc.

The guests were leading engineers from the petroleum, petro-chemical, and refining industries in the East. Wolverine Tube is now making plans to hold similar discussions in other parts of the country in the near future.

Morris Rejoins C-R-C As Veep and General Manager

GENE MORRIS

Gene Morris has rejoined Crutcher-Rolfs - Cummings, Inc., as vice president and general manager, A. S. Crutcher, president of C-R-C, has announced.

Morris was associated with Crutcher-Rolfs-Cummings from 1944 until 1950 when he resigned.

Morris' experience will be invaluable to Crutcher-Rolfs-Cummings' customers and will bring a fresh viewpoint to C-R-C operations, Crutcher said.

Jeff Owens has also joined Crutcher-Rolf-Cummings as service man after an absence of several years.

Oilwell Announces Changes In Central Midwest Area

D. L. ALLISON

The appointments of Doyle Lee Allison as district representative at Abilene, Tex.; Charles D. Vickers as field representative at Odessa, Tex.; William Ray Mayes as field representative at Graham, Tex.; and the transfer of James Gordon Harvey, field representative at Graham, Tex. to Pampa, Tex., have been announced by William Miskimins, Central Midwest area manager for Oil Well Supply Division of U. S. Steel Corp.

Allison was employed by Oilwell in

1948 at the division's Graham, Tex., store. In 1954 he was transferred to Albany, Tex., and appointed field representative, the position he held prior to his present appointment.

Vickers is returning to the employ of Oilwell after serving 3 years in the United States Army. He was employed by Oilwell in 1949 at Odessa as a storeman. In 1950 he was appointed field representative at this location, where he served until entering the service in 1952.

Mayes was employed in 1952 as a storeman at Graham and held that position until his present appointment.

Wiley to Manage Quaker's Belting, Packing Sales

The appointment of H. A. Wiley, Jr., as manager of belting and packing sales for Quaker Pioneer Rubber Mills, a division of H. K. Porter Co., Inc., has been announced by G. A. Dauphinais, vice president and general manager.

Wiley was formerly associated with one of the major eastern rubber companies in both production and sales engineering. He came to Quaker Pioneer in 1950 as a member of its production department. In his new position, Wiley will coordinate the factory and field activities of Quaker Pioneer's belting and packing departments.

T. M. Johnston Returns to Duties at Johnston Testers

T. M. Johnston has just returned to his duties as executive vice president of Johnston Testers, Houston, from Boston, Mass. Johnston completed the advanced management program course at Harvard School of Business Administration.

Failing of Canada Names Tucker as Vice President

J. T. TUCKER

J. T. Tucker, general manager of sales for George E. Failing Co. of Enid, Okla., a subsidiary of Westinghouse Air Brake Co., has been named vice president of the George E. Failing Supply Co., Ltd., of Edmonton, Alta., Canada. Tucker's election was announced by Paul Courtney, president of Failing. Tucker will continue to maintain his headquarters in Enid.

Gar Wood Appoints Peck Vice President, Sales

The appointment of Milton G. Peck as vice president and director of sales and advertising was announced by E. F. Fisher, president of Gar Wood Industries, Inc.

Peck for the past 4½ years was sales manager of the electric industrial truck division of Clark Equipment Co. and for 26 years was sales manager of the industrial truck division of Yale & Towne Manufacturing Co.

ElectroData Establishes Dallas Sales Facility

K. L. AUSTIN

ElectroData Corp., computer affiliate of Consolidated Engineering Corp., Pasadena, Calif., has established a southwestern regional sales and service facility in Dallas according to an announcement by marketing director Edwin S. McCollister.

The headquarters is the latest step in ElectroData's current regional expansion to provide technical and consulting service throughout the U. S.

A Special

New Product!

PRODUCED BY THE TENNESSEE CORPORATION, MINERS OF COPPER, ZINC, IRON AND SULFUR.

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TENNESSEE TC CORPORATION

For Removal of Sulfur Compounds in Petroleum Refining.

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COPPER CHLORIDE DIHYDRATE	98.0 %
WATER INSOLUBLE MAX.	0.10%
TIN, less than	0.01%
LEAD, less than	0.01%

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√	FREE FLOWING
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Magcobar means more than mud alone...
it means...

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Stretching to all corners of North America, Magcobar production facilities have expanded year after year to provide the oil industry with an abundant source of drilling mud materials for the present and the future. To accomplish this steady production progress, Magcobar has reinvested a far greater percentage of its income in additional production facilities for the oil industry than any other mud company. The scope of Magcobar plants is shown in this composite drawing. All these resources are provided for oil operators so that wherever they drill, whenever they drill, they may be assured of the same high quality product. Look for the Magcobar Dealer sign when you need mud.

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION
ONE OF THE DRESSER INDUSTRIES
HOUSTON, TEXAS

The Facts behind

the Success of the

MARTIN PLUNGER

There's an old saying which tells us that, "Nothing succeeds like success." And it's true. You see examples of it every day. But in the case of the Martin Plunger success has two distinct elements — the manufacturer's success in designing a functionally superior mechanical device, and the producer's success in overcoming sand and salt water conditions with the installation of Martin Plungers.

Take a water condition, for instance. Water is a lubricant for rubber. And since the Martin Plunger uses numerous split rubber-and-duck rings, the water content of the well actually serves as an efficient lubricant for the Martin Plunger. Where other plungers fail, the Martin Plunger goes on producing month after month.

In sand, these numerous split rubber and duck rings, held in individually machined grooves, form a sand resistant seal without a tight, wearing fit in the working barrel. Rubber-and-duck rings withstand sand abrasion better than any metal or hard material. Actually, the Martin Plunger produces a buffing and polishing action — won't score or scratch the working barrel.

Martin Plungers are designed for all rod pumps and tubing pumps . . . all sizes and lengths . . . for any depth. A wide range of ring sizes gives you any desired working fit. Write for the new John Martin Catalog No. 4, with helpful information on how to select the correct plunger for your particular installation and conditions.

Martin Plungers are available through all supply houses.

JOHN N. MARTIN

Manufacturer

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and Canada for users of Datatron high-speed electronic data-processing machines.

Kenneth L. Austin, former senior mathematician and supervisor of liaison and instruction, has been named manager of the southwestern office. Austin played an active part in the design of ElectroData's new magnetic-tape auxiliary storage system, each unit of which provides electronic computers with additional memory capacity of over 4 million digits.

Kobe Announces Changes In Sales Organization

Kobe, Inc., of Huntington Park, Calif., has established a new hydraulic sales division to meet expansion of activities according to an announcement by Ray Elner, manager of hydraulic sales.

A. R. TULLOS

S. S. McDONNOLD

The new division has been designated the East Texas-Gulf Coast sales division and will be headed by A. R. Tullos, recently promoted to division sales manager. With Tullos is district

CARL BROWN

P. M. WILSON

sales representative P. M. Wilson, who was transferred to Houston from Corpus Christi.

In separating this area from the former southern area sales division, division sales manager J. T. Lewis has been transferred from Fort Worth to Midland, where he will head the newly created West Texas-New Mexico sales division. With Lewis is S. S. McDonnold, recently promoted to district manager. In the Fort Worth office, district sales representative V. L. O'Neill, transferred from Tulsa, will be in charge of headquarters contacts in Dallas and Fort Worth.

W. C. PRIGGE

J. T. LEWIS

On the West Coast, Carl Brown, formerly manager of industrial sales in Cleveland, has been named Los Angeles Basin district sales manager for hydraulic sales. Also working out of the Los Angeles office, but in charge of the company's coastal sales, is district sales representative W. C. Prigge.

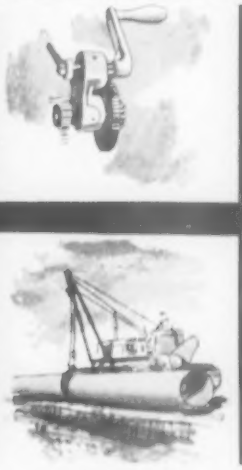
Garrett Oil Tools Makes Taylor Vice President

Garrett Oil Tools, Inc., of Longview, Tex., has announced the appointment of Taylor Milton as vice president in charge of manufacturing and engineering.

Formerly vice president of Walter Kidde Constructors, Inc., Milton has had extensive experience in industrial engineering, plant design, and production layout.

a precision instrument

H & M Pipe Cutting and Beveling Machines are designed and manufactured to high engineering standards. Close tolerances in gear design consistently give cleaner, more accurate cuts, yet the H & M is rugged and will withstand years of tough field use.



for pipe cutting and beveling

A complete line of beveling machines is available from H & M. The #1 machine will cut and bevel pipe as small as 4", the #5 machine will handle a diameter of 36". Once in place the entire 360° cut can be made in a matter of minutes with an effortless turn of the hand crank.

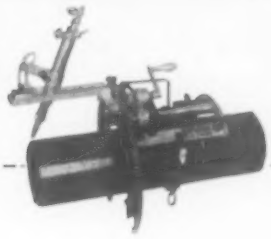
and

now lightest in its class

A new metal manufacturing process has recently made the H & M the lightest beveler in its class . . . has actually reduced the weights of the number 3, 4, and 5 machines by 40%. Think of what this means in the field—new lightness without any loss of durability.

gives you the most for your money

Point for point the H & M gives you more. It is actually possible to save one-half your labor and gas cost by using the H & M Pipe Cutting and Beveling Machine. Attachments are available for out-of-round and shape cutting. For more information, write H & M.



H&M PIPE BEVELING MACHINE COMPANY

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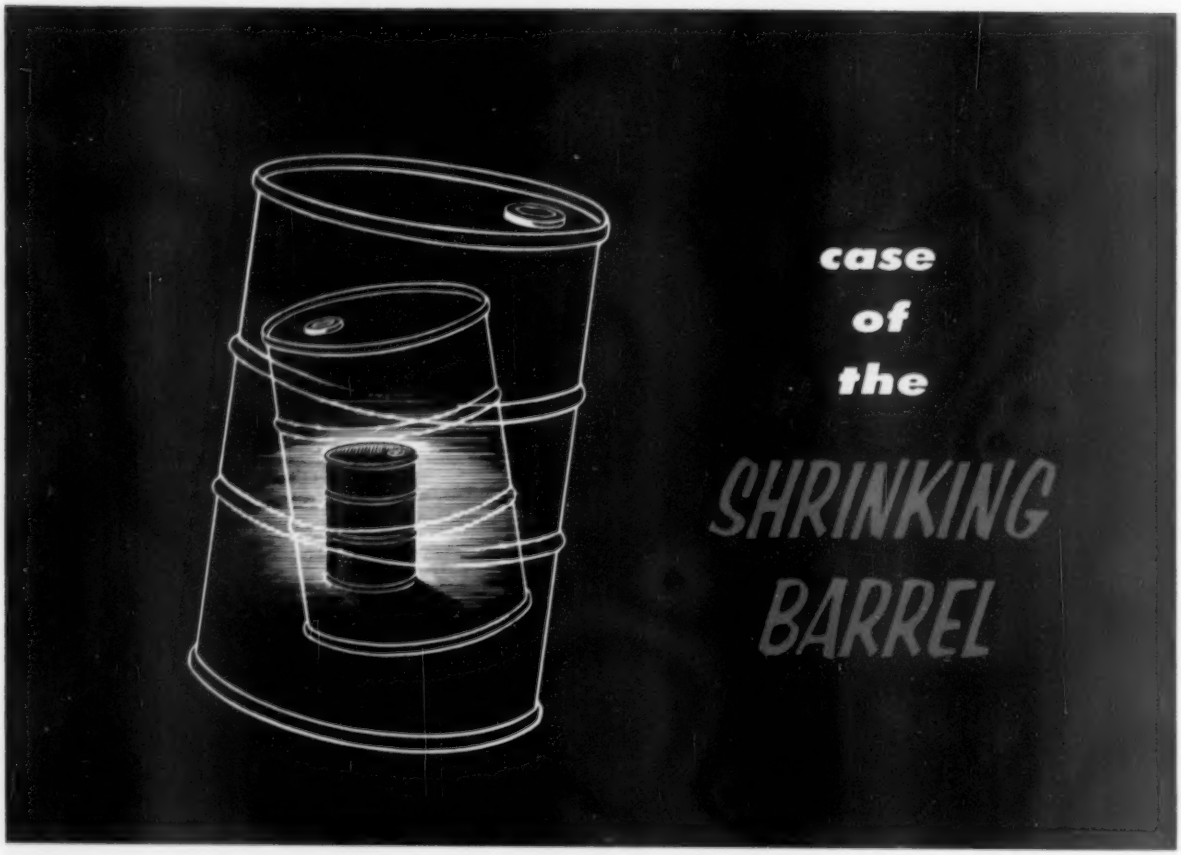


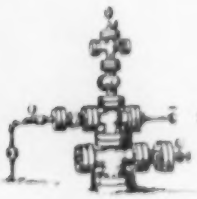
The barrel of oil you discover or purchase, in place in a reservoir, is not a barrel of oil when it reaches the stock tank.

Specifically, as one barrel of reservoir oil is brought to the surface (and its gas comes out of solution) it shrinks to less than a barrel. Often this deterioration of reservoir revenue runs as high as 60 percent.

You can't eliminate the loss but you can minimize it. Because the shrinkage factor is directly related to the amount of gas allowed to evolve from its oil at the separator, an analysis of the reservoir's individual fluid characteristics and behavior will reveal the proper choice of back pressure on the separator for obtaining an optimum balance of reservoir material.

This particular use of a Core Lab Reservoir Fluid Analysis Report is only one of several direct benefits. *If obtained and applied early in the life of key wells* these P-V-T data provide a key to establishing and maintaining a sound, overall economic-engineering program throughout the productive history of an entire field.

Proportionately, no other set of reservoir data can have more tangible effect on present and deferred income.



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DALLAS, HOUSTON, CORPUS CHRISTI, MIDLAND, ABILENE, SAN ANTONIO, TYLER, TULSA, FORT WORTH, WICHITA FALLS, SHERMAN, OKLAHOMA CITY, ARDMORE, BARTLESVILLE, PAMPA, ARKANSAS CITY, GREAT BEND, NEW ORLEANS, SHREVEPORT, HATTIESBURG, LAFAYETTE, DENVER, BAKERSFIELD, CASPER, BILLINGS, WORLAND, STERLING, EL DORADO, LUBBOCK, FARMINGTON, LOVINGTON, MONAHANS, SAN ANGELO, CALGARY, EDMONTON, REGINA

EXPLORATION

New Light on Reserves Estimates

by Frank J. Gardner

". . . The present oil reserve of the United States is predicted with considerable confidence to be in the range of 40 billion barrels rather than around 29 billion barrels."

For that cheering remark, the oil industry can thank Paul D. Torrey, chairman of the Secondary Recovery and Pressure Maintenance Committee of the Interstate Oil Compact Commission. His reasoning is sound, his prediction logical, and his confidence is timely.

A nation-wide survey . . . Speaking before the midyear meeting of the I.O.C.C. in Denver last week, Torrey presented his committee's first nation-wide survey of U. S. oil resources. The condensed results of that survey are shown in the table on this page. The figures are as firm as can be expected of any estimate, and they do generate considerable confidence. They reveal that the U. S. oil industry during its first 95 years uncovered a national oil reservoir that originally contained a whopping 271 billion barrels. They further reveal that under present economic conditions we can expect to recover only 88 billion barrels, or about 32.5 per cent of the original oil in place.

"The 183 billion barrels that will remain is indeed a challenging problem," Torrey says. "The fact should be emphasized that the efficiency of oil-recovery processes has been improved greatly in the last few decades, and there is no reason to believe that improvement will not continue in the future. Therefore, it can be foreseen that greater recovery of the nation's oil resources will be obtained in the future than has been the case in the past."

Torrey's committee was organized in 1947. Since then, its chief pursuit has been an inventory of fluid-injection projects in the oil-producing states, and a study of added oil recovery that might result from them. The I.O.C.C. has published several reports on secondary-recovery and pressure-maintenance operations in individual states, but this is the first time it has attempted a national survey.

Scores a point . . . The survey scores a telling point by disclosing a 39 per cent increase in proved recoverable reserves through these fluid-injection projects. Starting with its own primary reserve estimate of 27,786 million barrels, the compact committee breaks down secondary-recoverable oil into two categories: "Maximum recovery by known methods" and "recovery under present economic conditions" (as of January 1954). In other words, the first category is "susceptible" to recovery, while the second is fairly certain to be produced. How much oil will move from the first to the second category is dependent on future developments in methods, efficiency, and media, and on economic conditions in future years. "It is important to know, however, that this considerable amount of oil is susceptible to recovery by known methods."

The recovery under present economic conditions, when added to the primary reserve figure of 27,786 billion barrels, boosts total recoverable reserves to the 40-billion level, and is a pretty definite figure, according to Torrey.

And boosts reserves . . . ". . . It will be noted . . . that primary reserves estimated by the Compact committees . . . are slightly smaller than A.P.I. proved reserves, which is to be expected since the A.P.I. reserves include some oil that will be recovered as a result of secondary-recovery and pressure-maintenance operations . . . The fact that the findings of the two committees are not in agreement is not surprising, and really is no cause for concern. The Compact committee takes the optimistic view that the results that have been obtained in literally hundreds of fluid-injection operations . . . are sufficiently dependable to be used as a criterion for the estimation of the possible additional recovery than can be obtained . . ."

Torrey's point is well taken. Hundreds of secondary-recovery projects have reached the point where there's little doubt of their effectiveness in future recovery. For example, in 1954, the secondary-recovery committee of the I.P.A.A. published a flat prediction that Pennsylvania's old Bradford field still had 170 million barrels to produce, and that the other Pennsylvania fields would produce 50 million more. This estimate of 220 million barrels of recoverable oil is twice that shown in Torrey's table. The multitude of secondary projects to come in future years will contribute greatly to the nation's self-sufficiency in oil. Ingenuity is the mark of the oil man. He'll recover more of that 183 billion barrels of "unrecoverable" oil than we now think possible.

United States Oil Resources

(All estimates and figures as of January 1, 1954, in millions of barrels)

	Orig. oil content	Cum. prod.	A.P.I. proved reserve	I.O.C.C. primary reserve	Maximum recovery by known methods	Recovery under present economic conditions
New York	743	190	49	0	75	64
Pennsylvania	3,831	1,180	111	0	805	111
West Virginia	2,560	449	37	53	598	52
Kentucky	1,500	287	82	90	300	50
Ohio	4,232	631	32	25	150	7
Indiana	975	237	62	50	275	75
Illinois	7,000	1,688	625	400	2,000	1,000
Michigan	1,340	362	61	80	258	88
Kansas	12,900	2,470	913	850	350	150
Oklahoma	43,800	6,815	1,752	1,500	1,500	700
Louisiana	17,124	3,293	2,760	2,558	3,767	1,695
Mississippi	2,925	394	350	355	1,000	72
Arkansas	3,155	879	358	208	1,399	1,255
Texas	94,400	16,780	14,999	15,662	11,540	5,000
New Mexico	6,125	864	815	731	165	84
Colorado	3,000	238	319	328	300	200
Wyoming	9,063	1,138	1,279	1,209	906	270
Montana	1,624	198	208	195	142	13
California	54,000	9,699	3,919	3,305	3,500	614
Other states*	1,036	45	214	187	107	27
Total	271,333	47,817	28,945	27,786	29,137	11,527

*Including Ala., Nebr., N. D., Utah, Fla., Mo., S. D., Va.

Maytime Successes Abound

Louisiana Sets Exploration Pace

1. Pelican state's offshore bid sets record.
2. Three maritime fields opened in 1 week.
3. Pointe Coupee production fans out.
4. Northwest movement at Anse La Butte.
5. Confirmation at Joseph Bayou discovery.
6. Pettit oil in Bethany-Longstreet area.

Texas—From Lavaca Bay to Odessa

7. Another new field at Lavaca Bay.
8. New life for old Saratoga dome.
9. No letup in deep West Texas drilling foreseen.
10. Austin chalk play has a steady development.

Oklahoma Takes Deep Look

11. New pay zone for southern Oklahoma . . . the Arbuckle?
12. Lower Dornick Hills surprise.
13. Viola trend at Lone Grove nearing 30-mile mark.

Hugoton—Exciting, Growing Province

14. Widespread discoveries, offsets, and confirmations in a three-state area make the Hugoton embayment one of the most attractive new oil and gas hunting grounds in the nation.

Montana—East to West

15. Deep Red River (Ordovician) production confirmed at Brorson field.
16. Sizable gas reserves may be in store for the disturbed belt of northwest Montana as a result of the Union Oil Co. 1 Morning Gun discovery well. The well flowed commercial gas, setting off a flurry of new locations in this heretofore unsuccessful province.

Canada — Remote Gas Strike, and Sundre Confirmation

17. Gas discovery hinted in British Columbia's far north Paddy River region.
18. Mississippian production at Sundre confirmed.

Sanger Sand—California Pay of Promise

19. Fresno County's Sanger sand has bright outlook.

Shell and the Paradox

20. Shell Oil Co. apparently has its fourth discovery in the Paradox basin in the past 2 years . . . Humble drilling Arizona wildcat in East Boundary Butte area.

Wildcats Hit From Breton Sound to Paddy River

by John C. McCaslin

EVERY corner of the wildcat country was heard from in May. Discoveries with promising development futures ranged from Breton Sound off Louisiana to the far northern reaches of British Columbia, and from Fresno to the bottom of the Williston basin.

Delta and bayou exploration . . . The outstanding oil-finding province was the Louisiana Gulf Coast.

Three maritime fields were opened off the Pelican State in 1 week. The rapidly expanding offshore search hit twice off the Mississippi River Delta of southeastern Plaquemines Parish, and once off the eastern coast of St. Bernard Parish in Breton Sound.

. . . Block 5, South Pass area. The California Co. 1 State Lease 2589 is a new oil field 2 miles north of Shell Oil Co.'s Block 6 field.

. . . Block 56, West Delta area. Continental Oil Co. opened a small gas-condensate field at 1 State Lease 2550, 6 miles from land, 3 miles from production. The new field is west of the Southwest Pass tip of the delta.

. . . Breton Sound. The third new tidelands success is located in Block 1 in the northwestern corner of the sound at Republic Natural State Lease 2464. This new field is 2 miles south of The Texas Co.'s Block 69 gas field in the Chandeleur Sound area.

. . . Joseph Bayou. The Texas Co. confirmed its recent oil strike on the Mississippi River Delta area of Plaquemines Parish. The southeast offset to the discovery well made 130 bbl. of oil per day. The new field underlies the Mississippi River's Southwest Pass.

The big offshore news was Louisiana's record bid offer of $7,660,111 for a 4,687-acre offshore tract at the mouth of the Mississippi which was immediately contested by the federal Government.

Total May Completions, Exploration and Development

	Total completions					Total wildcat wells					Active operations
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage	
Alabama	1	0	0	1	6,738	1	0	0	1	6,738	2
Arkansas	55	36	0	19	172,142	13	3	0	10	44,163	48
California	224	154	5	65	1,125,807	56	5	2	49	308,555	211
Colorado	119	37	6	76	642,993	63	5	4	54	335,078	118
Florida	3	0	0	3	21,160	3	0	0	3	21,160	4
Illinois	216	121	0	95	520,866	35	3	0	32	83,237	518
Indiana	56	6	2	48	80,600	27	0	0	27	37,701	66
Kansas	331	183	29	119	1,182,690	58	13	4	41	236,280	415
Kentucny	78	27	10	41	122,663	17	4	0	13	25,633	187
Louisiana	377	247	26	104	2,341,879	67	19	3	45	636,802	427
North	186	140	13	33	455,144	15	2	0	13	59,660	141
South	191	107	13	71	1,886,735	52	17	3	32	577,142	286
Michigan	39	16	1	22	99,550	15	1	0	14	37,973	130
Mississippi	46	17	1	28	338,740	20	2	0	18	136,544	49
Montana	33	17	2	14	156,095	6	1	0	5	36,000	61
Nebraska	78	24	0	54	458,792	33	2	0	31	193,558	79
New Mexico	161	82	48	31	652,788	14	2	1	11	70,367	196
Northwest	51	1	41	9	160,785	6	1	1	4	16,843	50
Southeast	110	81	7	22	492,003	8	1	0	7	53,524	146
New York	43	20	0	23	61,920	0	0	0	0	0	22
North Dakota	23	19	0	4	157,483	2	0	0	2	17,054	25
Ohio	101	52	13	36	200,710	3	0	0	3	5,611	197
Oklahoma	696	411	35	250	2,150,891	65	6	2	57	294,747	1,146
Pennsylvania	63	14	30	19	167,169	0	0	0	0	0	71
South Dakota	0	0	0	0	0	0	0	0	0	0	12
Texas	1,740	1,071	58	611	7,349,009	409	66	13	330	2,107,221	1,534
North Central (7-B & 9)	686	413	7	266	2,057,561	165	32	2	131	626,560	401
West (7-C & 8)	391	303	5	83	2,103,833	61	11	0	50	383,858	537
Panhandle (10)	88	64	16	8	317,011	8	2	2	4	60,810	73
East (5 & 6)	74	33	9	32	346,238	19	2	1	16	87,960	98
Gulf Coast (2 & 3)	230	104	10	116	1,480,421	76	10	5	61	580,665	210
Southwest (1 & 4)	271	154	11	106	1,043,945	80	9	3	68	367,368	215
Utah	7	3	0	4	28,971	3	0	0	3	10,057	27
West Virginia	58	6	39	13	143,801	5	0	3	2	10,163	213
Wyoming	65	31	0	34	293,408	20	2	0	18	72,867	153
Miscelleanous	0	0	0	0	0	0	0	0	0	0	85
Total May 1955	4,613	2,594	305	*1,714	18,476,865	935	134	32	769	4,727,509	5,916
Total April 1955	4,942	2,787	280	1,875	19,343,931	1,060	178	33	849	5,034,469	5,517
Cumulative 1955	22,658	12,945	1,337	8,376	90,713,025	4,751	728	150	3,873	23,092,610	
Cumulative 1954	21,699	12,284	1,491	7,924	89,266,297	4,334	627	133	3,574	21,252,218	
Western Canada	124	89	3	32	546,062	39	8	3	28	218,609	
Alberta	57	35	2	20	340,558	25	7	2	16	164,031	
Saskatchewan	50	38	1	11	168,600	13	1	1	11	50,951	
Manitoba	17	16	0	1	36,904	1	0	0	1	3,627	
B.C.-N.W.T.	0	0	0	0	0	0	0	0	0	0	
Cumulative 1955	883	621	42	220	3,942,089	257	52	25	180	1,368,206	

*Incl. 54 service wells: S. La. 2, N. Y. 23, Pa. 7, Ohio 1, Okla. 21. †Incl. 43 cond. wells: So. La. 10, Miss. 1, Okla. 7, West Texas 1, E. Texas 4, Texas (Dist. 3) 7, Texas (Dist. 1) 1, Texas (Dist. 4) 12. ‡Incl. 12 cond. discoveries: S. La. 7, E. Texas 1, Texas Gulf Coast 4. §Incl. Tenn. 1, Ida. 2, Nev. 2.

Louisiana inland success . . . Sinclair Oil & Gas Co. opened a new oil area in southern Pointe Coupee Parish on the inland fringe of coastal fields. The discovery, 6 miles northwest of Fordoche, is the northernmost field in the parish. The 1 Gosserand flowed 270 bbl. of oil per day from the Wilcox sand.

. . . Anse La Butte. New deep flank-sand development around old Anse La Butte dome in the St. Martin-Lafayette Parish line is extended to the far northwest side. Pan American Production Co. 1-B Nickerson is a 200-bbl. well more than 1 mile from the old shallow producing area on the dome.

. . . Pettit oil. A new oil discovery was reported in the Bethany-Longstreet area of DeSoto Parish at Latex 1 Atkinson heirs, 11 miles northeast of Logansport, closest Pettit oil production.

Texas—Deep and shallow . . . Deep West Texas exploration, a new field at Lavaca Bay, and the Saspamco Austin chalk development featured wildcatting in the Lone Star State.

Layton Brown opened a new oil field on the north side of Lavaca Bay in northern Calhoun County . . . the third new field in that area in the past 2 months. Production is from the Melbourne (Frio) sand. Halbouty opened another new producing area around the flanks of the old Saratoga salt dome in Hardin County, upper Texas Gulf Coast.

. . . West Texas. Deep exploration in West Texas by large operators shows no signs of a letdown. A second look at old producing areas for the possibility of bypassed pre-Permian structures has paid off with handsome rewards . . . 12 new fields this year. These new fields lie along the trend of Central Basin platform fields. The Ellenburger, Devonian, and Strawn are the objectives in this exploratory program.

. . . Saspamco area. Continued development of the Austin chalk in this area 15 miles southeast of San Antonio is expected, but production for the most part will be limited to known trends and old producing areas.

Arbuckle era in Oklahoma . . . The nominee for the discovery of the year in Oklahoma will likely be Frankfort Oil Co.'s 2 Williams in 12-5s-2w, Carter County. Recovery of nearly 5,000 ft. of oil on test in the Arbuckle has commanded another look at the formation's southern Oklahoma possibilities. The Arbuckle section is a promising future petroleum reservoir for the complex southern Oklahoma region. Few if any wells have ever drilled a complete section of the 6,000-ft.-thick formation.

. . . Dornick Hills. Another new-pay discovery of importance to southern Oklahoma is indicated on the south flank of Carter County's Lone Grove area at 1 Greenwood, another Frank-

HOLDS PRESSURES Automatically

GUIBERSON Type E TUBING STRIPPER

FOR LOW AND MEDIUM PRESSURES

Low in height and compact, this new Guiberson stripper speeds up running or pulling tubing because it seals automatically. Rubber requires no tightening or adjustment. Cup-shaped rubber is specially designed to be tear resistant — specially compounded to resist damage from oil, gas or well fluid. Reinforced with steel wires and bushing.

Bayonet-type latch on cover plate makes it easy and quick to remove or install rubber. Handles lock the cover on the body. Cover plate accommodates Guiberson Tubing Spider. Body may be tapped for two 2″ side outlets on special order. Pressure rating, 750 p.s.i. working pressure, 1500 p.s.i. test pressure. For 2″, 2½″ and 3″ tubing, and for flange sizes 6″-400, 6″-600, 6″-900, 8″-400 and 8″-600.

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ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.
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Total Depth Classifications, May 1955

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	0	0	0	0	1	0	0	0	0
Arkansas	0	28	18	4	5	0	0	0	0
California	23	24	27	60	44	30	13	2	1
Colorado	0	0	6	26	81	5	1	0	0
Florida	0	0	0	2	0	0	0	1	0
Illinois	27	72	117	0	0	0	0	0	0
Indiana	24	26	6	0	0	0	0	0	0
Kansas	1	37	166	116	11	0	0	0	0
Kentucky	36	27	12	3	0	0	0	0	0
Louisiana	2	145	26	17	34	58	65	22	8
North	2	145	21	1	13	3	1	0	0
South	0	0	5	16	21	55	64	22	8
Michigan	6	16	10	6	1	0	0	0	0
Mississippi	0	1	1	7	23	8	6	0	0
Montana	0	7	8	5	6	7	0	0	0
Nebraska	0	0	4	5	69	0	0	0	0
New Mexico	3	46	61	19	20	3	8	1	0
Northwest	1	28	7	1	14	0	0	0	0
Southeast	2	18	54	18	6	3	8	1	0
New York	0	43	0	0	0	0	0	0	0
North Dakota	0	0	8	0	0	14	0	1	0
Ohio	37	25	38	0	1	0	0	0	0
Oklahoma	86	214	229	61	68	23	8	7	0
Pennsylvania	1	43	14	1	4	0	0	0	0
South Dakota	0	0	0	0	0	0	0	0	0
Texas	160	398	298	317	335	171	46	13	2
North Central	99	257	94	122	86	10	8	0	0
West	10	42	75	84	102	46	20	12	0
Panhandle	0	6	72	2	2	5	0	1	0
East	6	8	6	18	28	8	0	0	0
Gulf Coast	9	9	14	45	63	78	10	0	2
Southwest	26	76	37	46	54	24	8	0	0
Utah	1	2	0	0	4	0	0	0	0
West Virginia	0	31	17	6	4	0	0	0	0
Wyoming	6	7	12	17	15	8	0	0	0
Miscellaneous	0	0	0	0	0	0	0	0	0
Total May 1955	413	1,192	1,078	672	726	327	147	47	11
Total April 1955	435	1,243	1,302	695	699	358	140	58	12
Cumulative 1955	1,958	5,546	5,690	3,366	3,477	1,628	680	269	44
Western Canada	0	19	48	21	22	7	6	1	0
Alberta	0	0	15	9	19	7	6	1	0
Saskatchewan	0	3	32	12	3	0	0	0	0
Manitoba	0	16	1	0	0	0	0	0	0
B.C.-N.W.T.	0	0	0	0	0	0	0	0	0
Cumulative 1955	6	139	223	167	278	49	19	2	0

fort well in 12-5s-2w. The lower Dornick Hills sand is stratigraphically near the Lake Ardmore part of the Springer-Pennsylvanian sand.

Other May strikes . . . Initial potential at the first follow-up well to the recent Sundre Mississippian discovery 60 miles northwest of Calgary in Alberta showed confirmation assurance. At month's end an important gas strike was unofficially reported in the Paddy River area of northeastern British Columbia, 110 miles north of Fort St. John town.

In California the new Sanger sand (lower Miocene) uncovered by tests ½ mile southeast of Guijarral Hills production also has been found in an upstructure well in the Fresno County field. Recent drilling in the Polvadero area indicated the Sanger was productive there. Upstructure location of the Sanger sand discovery indicates the shallower pay may have been overlooked in other Guijarral Hills producers when they were completed 6 years ago.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

OKLAHOMA

North Helsel-Bartlesville Sand Pool Extended to South

Cleveland County's North Helsel-Bartlesville sand oil pool has been extended to the south at E. J. Davis et al 1 Hassman-B, NE NW NE 21-7n-1e.

The ¼-mile south extension well flowed 45 bbl. of oil in 24 hours through open hole at 6,012-45 ft. that had been fractured.

Commercial Oil Reported At West Chitwood Wildcat

Frankfort Oil Co. 1 Mutz, SE NW NW NW 24-5n-7w, has indicated commercial oil production on drill-stem test at 9,827-59 ft. Recovery was 6,369 ft. of 36°-gravity oil on the test. Bottom-hole pressure shut in was 2,650 psi. in 30 minutes. Another test up the hole at 9,825-44 ft. recovered 5,310 ft. of gas, 80 ft. of 36°-gravity oil and 180 ft. of heavily oil and gas-cut mud.

KANSAS

Barber County Discovery Completed in Mississippian

Lion Oil Co. has successfully completed the 1 Brooks and Younger, located in the NW¼ of the NW¼ of Section 23, 32s-13w, Barber County. This was a wildcat well in the Brooks and Younger unit, owned jointly by Lion and Gulf Oil Corp., and operated by Lion.

The well tested 72 bbl. of 30°-gravity oil and 1,700 M.c.f. of gas per

day through an 18/64-in. choke. Perforations are from 4,423 ft. to 4,428 ft. in the Mississippi "chat" but it is estimated that the well has 30 ft. of pay zone.

HUGOTON EMBAYMENT

TEXAS PANHANDLE

Gray County's Granite Wash Development Continuing

Gray County's thick Pennsylvanian granite wash sections, just north of the Amarillo Mountains, is picking up interest. Laketon field in the northeast part of the county is the focal point of exploratory and development activity. This field was opened last year at Phillips Petroleum Co. 1 Delp in Section 110, Block M-2, BS&F Survey. That well was finaled for 257 bbl. of oil per day from granite wash pay at 9,558-69 ft. The second well, the 2 Delp, has found seven granite wash pay zones. That well is due to test the Ellenburger. First Ellenburger production for the Panhandle was established some weeks ago in this Laketon area. There are currently two field wells under way in Laketon. Other granite wash areas in this deep western Anadarko basin region are: Hobart Ranch field, Quinduno field.

Map of western Anadarko basin area north of the Amarillo uplift shows Pennsylvanian granite wash development area. They are: Hobart Ranch and Laketon-Delp.

Three-Mile Extension Added to North Hansford

North Hansford field, a north-central Hansford County multipay field, has been expanded 3¼ miles at Sharples Oil Corp.-Baker & Taylor Drilling Co. 1 R. D. Thomlinson Gas Unit, Section 3, Block 2, SA&MG Survey, 10 miles northeast of the town of Gruver.

The well, 1 mile northeast of North Hansford's Tonkawa gas discovery well, made 5,000 M.c.f. of gas per day plus distillate. Perforations in the Morrow sand were at 6,914-21 ft. The new discovery is 4 miles northeast of North Hansford's Cherokee sand producing area.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Terry County Prospect Flows More Devonian Oil

The Texas Co. 1 Spradling, deep test 4 miles southwest of Gomez in Terry County, kicked off and flowed 62.75 bbl. of oil in 8 hours after perforating in the Devonian at 12,755-60 ft. The flow died at the end of the 8-hour period. Shakeout was 8 per cent water.

The well has developed oil on several drill-stem tests, and indications that it has 14 ft. net pay section above water. Location is in Section 115, Block D-11, C&M Survey. It is 5 miles southeast of Coroco-Devonian field, where the discovery well, Coroco 1 Atlas Life, showed possibilities of having 30 ft. of pay, but completed as a pumper from 3 ft. of Devonian pay.

The Coroco discovery is currently

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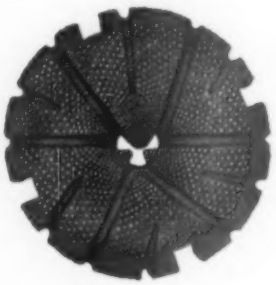

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Fundamentally, cable-tool action is like the snap of a blacksnake whip. It's the SNAP of the whip, not the weight, that does the damage—and it's the SNAP of the tools—no less than their weight—that drills the hole.

This fact, long established but persistently overlooked, accounts for the design—and the success—of Walker-Neer Spudders. Walker-Neer has replaced rigid, gear-driven "churn-type" spudding actions with a V-belt drive and rubber torsion shock absorber that gives tools the snap of a blacksnake whip. The tools strike harder, snap back quicker, and you make more hole per hour. In addition, you get the smoothest, quietest, most jar-free drilling action in the field.

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being reworked by Jake L. Hamon. It is designated as 1 Atlas Life and was testing the Permian through perforations at 9,202-22 ft. Swabbing returned up to 5 bbl. of oil an hour.

Ector County new pay . . . The second well in the York-Ellenburger field, southeast of Penwell, developed good oil shows while testing the Devonian.

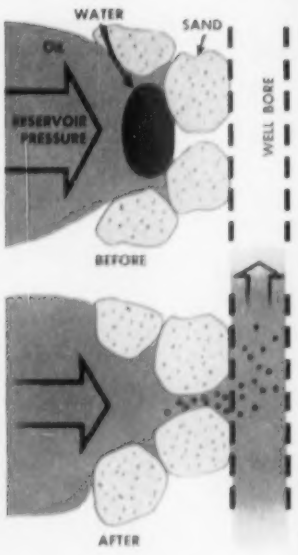
The well is Humble Oil & Refining Co. 1-G TXL, ⅜-mile southeast offset to Humble's 1-B York, discovery. A 2-hour test at 11,030-11,180 ft. recovered gas in the drill pipe, plus 188 ft. of heavily oil and gas-cut mud.

Heavy Spraberry flow . . . C. L. Norsworthy 1 Cone-Hudgens, Spraberry field test in Reagan County, completed for a calculated daily flowing potential of 1,199.6 bbl. of 42° oil. The flow was based on a 10-hour test through ¾-in. choke which produced 494.3 bbl. of oil. Pay section was treated between 7,675-7,765 ft.

Reeves County deep test . . . Gulf Oil Corp. and Phillips Petroleum Co. 1-KK State, northeast outpost to the Toyah-Devonian gas field, flowed gas at the rate of 5,510 M.c.f. on a 40-minute drill-stem test at 12,639-12,706, ft. identified as Siluro-Devonian.

Improve Oil Production with PR-277

a surface-active agent for use in water-block removal



PR-277 removes water blocks by lowering the oil-water interfacial tension which causes the water droplets to lose their rigidity and allows the oil to flow.

Aquaness has developed PR-277 to stimulate well production by removing water blocks and solving problems caused by water.

Recently, seven poor producing wells were treated with PR-277. Only 196 gallons of this chemical were used, resulting in a total *daily* oil production increase of 165 barrels.

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Gentlemen: Please send me additional information on PR-277.

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Address_____ City_____ State_____ O&G3

PETROLEUM REVIEW, ECTOR COUNTY, TEXAS. By Robert L. Phifer. Published by Phifer Petroleum Publications, P.O. Box 20,024, Houston. $10.

This book, which is third in a series, lists producing fields in Ector County. Detailed information on each field includes discovery wells, electrical logs, contour and ownership maps. Status of each field is shown as of March 1, 1955. Number of producing wells, by years, is tabulated along with yearly production. Cumulative production figures are divided into oil, condensate, and gas. A full-page geological chart lists the various formation members, with localized names of producing sections.

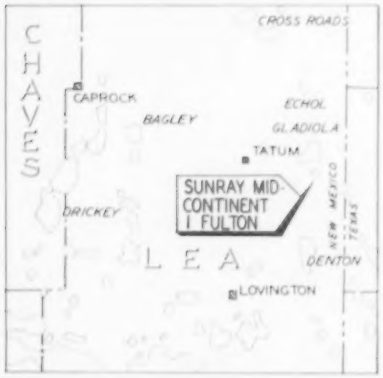
ARK-LA-TEX

SOUTHEAST NEW MEXICO

Wolfcamp Oil Shows At Lea County Wildcat

Sunray Mid-Continent 1 Fulton, Devonian exploration in 6-13s-38e, found good shows on a drill-stem test in the Wolfcamp, then continued drilling ahead on a 12,750-ft. contract.

Oil was recovered on a 3-hour test at 9,678-9,711 ft. Gas surfaced in 2



Devonian wildcat developed oil shows while drilling the Wolfcamp.

minutes and recovery in the pipe was water blanket plus 5,220 ft. of clean oil, part of which unloaded when pipe was pulled. Recovery below the circulating sub was 90 ft. of clean oil, with no water. Bottom-hole flowing pressure ranged from 930-2,335 psi.

Location of the wildcat is 3 miles from Devonian production at Gladiola field, and approximately 5 miles west of the big Bronco-Devonian field in Lea County, New Mexico, and Yoakum County, West Texas.

Continental Oil Co. 1-B-9 Sanderson, 9-20s-36e, deep exploration located ¾-mile west of 5,000-ft. production in the Eunice-Monument field, has been plugged back and completed. Total depth was 10,640 ft.

Operators perforated at 3,950-65 ft. and completed the well for a pumping potential of 280 bbl. of 38° oil. Lowest

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4600 BROADWAY
SAN ANTONIO, TEXAS

March 3, 1955

Mr. Marvin Chancellor
Reed Roller Bit Company
P. O. Box 7038, Hackberry Sta.
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Dear Sir:

We are pleased to report the following data on the string of 3 1/2" drill pipe in service on our Rig No. 1.

This string of pipe was purchased in December, 1949, and was equipped with 4 3/4" Reed Super Shrink-Grip Tool Joints. Since we were doing a lot of work inside 6" casing, it was not possible to add hard face bands.

According to our records, these tool joints have drilled 268,000 feet of hole. During this time, we have had no wash-outs or fishing jobs of any kind caused by tool joint failure.

This outstanding service record is the reason why we are replacing our worn tool joints on all our rigs with Reed Super Shrink-Grip joints.

Yours very truly,

W. F. Sutton

W. F. Sutton

WFS:bd

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marker reported at this time is the Bone Springs at 6,475 ft. on elevation of 3,626 ft.

EAST TEXAS

Anderson County Woodbine Discovery Completed

Douglas & Grelling 1 W. T. Bridges, 12 miles southeast of Palestine in the southeastern corner of Anderson County, has been completed as a gas-distillate Woodbine discovery.

Final perforations were at 5,348-56 and 5,368-83 ft. Potential was 38,000 M.c.f. of gas per day, plus 32 bbl. of 67.6° distillate, through 14/64-in. choke. Flowing tubing pressure was 1,612 psi.

Douglas & Grelling were said to have drilling under way at an extension test, approximately 1 mile west of 1 Bridges. Location was reported as Robert Erwin Survey, A-262, and on W. S. Sharver land.

Sun Plans Smackover Wildcat

Sun Oil Co. will drill a Smackover test in the Chapel Hill field of east-central Smith County. The project will be 1 J. W. Elliott, in T. P. Payne Survey 109, A-763. Contract depth was 15,300 ft.

Panola County . . . The Chicago Corp. 2 Carthage Unit 3, Smackover wildcat in the Carthage field, has been plugged back from total depth of 11,443 ft. Operators set pipe at 9,259 ft. and were testing the Cotton Valley. This test is the nearest Smackover exploration to Sun's proposed well, and is approximately 40 miles southeast of 1 Elliott.

GULF COAST

TEXAS GULF COAST

Second Cummins Producer Uncovers Deeper Pay Zone

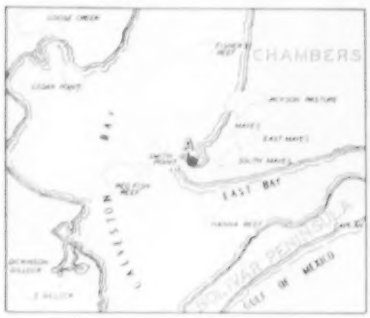
Skelly Oil Co.'s third attempt to confirm its 1953 discovery of production in the Cummins area, 2 miles north of Van Vleck, in northeastern Matagorda County, has resulted in the opening of a deeper sand than that from which the first well is productive.

The deeper sand, perforated at 8,921-25 ft., is in the company's 4 Savage, 2,286 ft. southwest of the discovery well, 1 Savage. The new well, plugged back from drilled depth of 12,328 ft., flowed 59 bbl. of 41.6°-gravity oil per day through 3/32-in. choke with pressure of 1,275 psi. and gas-oil ratio of 2,400 cu. ft. per barrel.

The discovery well produces 33.6°-gravity oil from sand at 8,476½-79½ ft. Skelly's first confirmation attempt, 933 ft. northeast of the discovery well, was dry at 8,520 ft. Its next location, 1,043 ft. west of the discovery well, failed at 9,499 ft.

Smith's Point Discovery Opens Trinity Bay Field

The Texas Co. has a new Frio discovery well in the Smith's Point area of Chambers County. It is the company's 1 State, in Tract 107, Trinity (Galveston) Bay, rated on potential gage as good for 107 bbl. of 33.8°-gravity oil per day, flowing through ⅛-in. choke with pressure ranging from 1,600 to 2,000 psi. Flow was with gas-oil ratio of 2,276 cu. ft. per barrel. Total depth is 11,532 ft.



Location (A) of The Texas Co.'s new Trinity (Galveston) Bay discovery well in the Smith's Point area of Chambers County.

Bottom location is 300 ft. offshore from Smith's Point. Hole was drilled directionally from surface location on the north shore of the peninsula, on the east side of the bay. Location is 2 miles east of Smith's Point field, in the bay, and about 2½ miles southwest of the onshore South Mayes field.

MISSISSIPPI

Three New Wilcox Areas Produce in Mississippi

Potential tests have been completed at two new Wilcox oil discoveries in southwestern Mississippi, one in northeastern Wilkinson County, and the other in southwestern Jefferson County. Another indicated Wilcox discovery, located in Jefferson County, is in the making with pumping tests under way.

In Wilkinson County, Calto Oil Co. 1-D Crosby, in 13-3n-1w, 4½ miles north of Saukum field, pumped 55 bbl. of net 39°-gravity oil per day. This was 20 per cent of total fluid lifted. Wilcox is perforated at 5,352-54 ft. "Mud Creek" is the name of the new field.

The completed Jefferson County discovery is by John S. Callon at his 1 Valentine, in 65-8n-1w, which flowed 112 bbl. of 30°-gravity oil per day through 9/64-in. choke. Tubing pressure gaged 375 psi. Perforated interval is 4,056-72 ft. in the Wilcox "4,600-ft." zone. Location is ¾ mile northwest of Sunnyside field.

Calto Oil Co. and G. W. Gulmon have placed their 1-B Guidon, indicated Wilcox discovery well 1¼ miles northwest of Church Hill field, in Jefferson County, on the pump for potential test runs. The well is reported to be making approximately 60 bbl. of oil per day from Wilcox perforations at 5,395-98 ft.

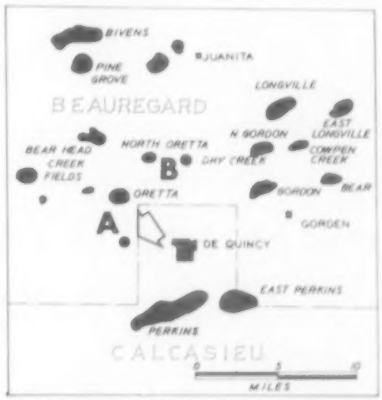
SOUTH LOUISIANA

Second Strike in Month Assured DeQuincy Area

Discovery of another Cockfield-Yegua reservoir in the DeQuincy area of southern Beauregard and northern Calcasieu parishes is virtually assured by results of initial tests in a wildcat drilled by General Crude Oil Co. and Hurt Oil Co., Ltd., of Houston. It is the second discovery in the area within a month.

The new discovery well, 1 Lutcher-Moore, in 16-7s-11w, flowed at the rate of 1,800,000 cu. ft. of distillate-rich gas per day through ¼-in. choke. Pressure gaged 1,250 psi. Pay is perforated at 8,636-52 ft. Total depth is 9,800 ft.

Location is 2½ miles west of DeQuincy (northern Calcasieu Parish), in southern Beauregard Parish. It is 6 miles southwest of a Cockfield gas-condensate discovery well, 4 miles north of DeQuincy, completed last month by Justiss-Mears Oil Co., Inc., and Winston L. Stokes (*The Oil and Gas Journal, May 9, 1955, page 179*). Its productive interval is 8,455-60 ft.



Portion of southern Beauregard and northern Calcasieu parishes, showing: A- location of General Crude Oil Co.'s new discovery well west of DeQuincy, and B- location of Justiss-Mears Oil Co.'s previously completed discovery well at Dry Creek, north of DeQuincy.

The latter operators are nearing the discovery well's pay zone in their second test, 1 McKnight, 2,800 ft. northwest of the discovery producer, 1 Musser-Davis. This is designated as the Dry Creek area. The wells are in 24-6s-11w.

New Production Indicated In Hope Villa Discovery

Bateman Drilling Co.'s wildcat in the Hope Villa area, 10 miles southeast of Baton Rouge, in East Baton Rouge Parish, is reported to have flowed at the rate of 6 bbl. of 45°-gravity oil per hour through an adjustable choke while testing perforated interval at 10,328-40 ft. Flowing pressure was 650 psi. The well is expected to be completed in this pay.

The new well, 1 Campbell, in 48-8s-2e, is ½ mile northwest of a well completed by T. G. Markley and associates pumping 5 bbl. of net oil and about 90 bbl. of water per day from pay at 10,337-40 ft. The area is 4 miles southeast of Atlantic Refining Co.'s Baton Rouge field.

EASTERN INTERIOR

ILLINOIS

In Wayne County Skiles Oil Co. and Mt. Carmel Drilling Co. 1 Virginia Haines, NE SW NE 26-1s-9e, 4 miles northeast of Golden Gate, flowed 242 bbl. of oil per day natural from the O'Hara lime at 3,281-98 ft. on ⅜-in. choke. This new pool is 1 mile east of Half Moon pool (McClosky production).

● Calstar Petroleum Co. 1 William B. Stephens, SW NE SW 16-5s-7e, swabbed 4 bbl. of oil hourly natural after shot in the Cypress at 3,028-52 ft. The well is 4 miles east of McLeansboro in Hamilton County.

● The 1 Nellie Horn, NE NW SE 20-2s-10e, Aux Vases discovery in Edwards County, has been completed by George Cullum and Don Lawhead, 4 miles southeast of Albion. The well pumped 180 bbl. of oil per day at 3,181-3,212 ft. It is a 1-mile east extension to Ellery pool.

● Tony Forino 2 J. A. and Roy Shelton, SW SW SW 28-1n-5e, recovered 1,320 ft. of gas, 130 ft. clean oil, and 30 ft. of mud-mixed oil on a test of the O'Hara lime at 2,876-84 ft. The Wayne County wildcat is more than 1 mile from O'Hara production.

WESTERN KENTUCKY

In Christian County, 17-H-27, Walter Sargent and Merle B. Piper 1 H. & E. Coombs, 2½ miles east of Apex, is

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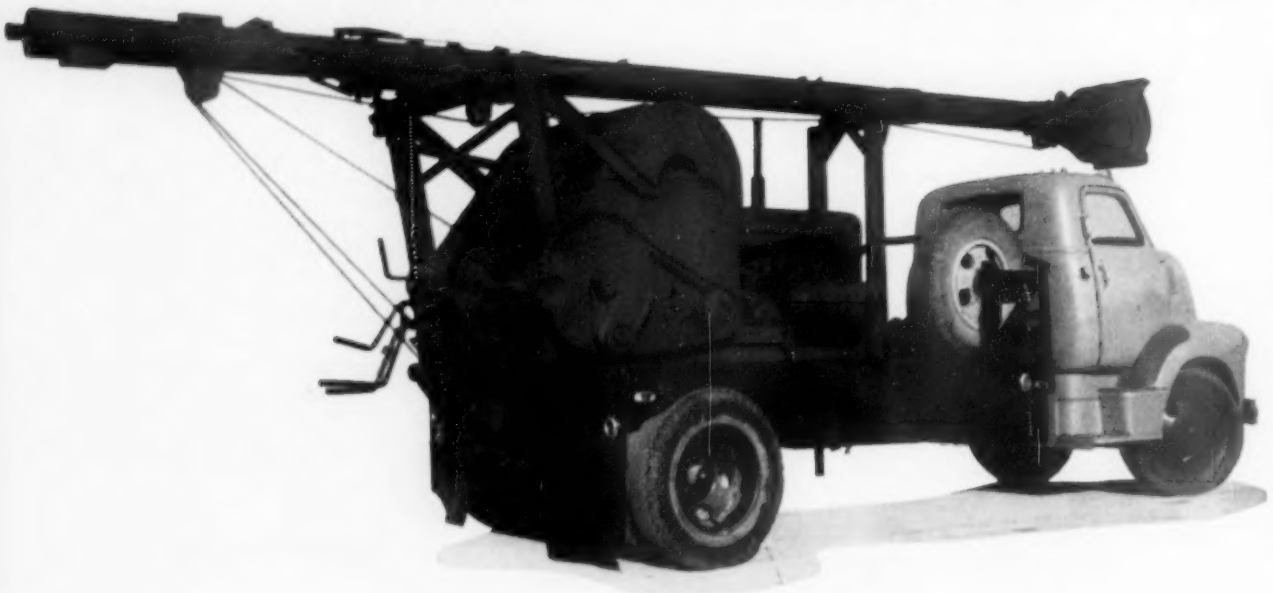

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completing. The well flowed at the rate of 672 bbl. per day from the Benoist (Bethel) sand at 760-13 ft. The well is now shut in for pumping equipment installation.

GREAT LAKES

MICHIGAN

A new Reed City zone oil pool may be the result of a wildcat now under test in Winfield Township, Montcalm County. The new test is Albert E. Anderson and Harry Crawford 1 Eickenroth & Lean, SE SE SW 28-12n-9w, which was acidized with 500 gal. after hole carried 1,000 ft. of free oil natural in about 48 hours after drill-in. Wildcat, located just west of an earlier test well which was near-commercial in this same pay zone, was unofficially reported to have swabbed and flowed close to 50 bbl. of net oil on first tests after acid treatment. Well was drilled to 3,353 ft., total depth, with pay showing from 3,350 ft. The new Anderson-Crawford wildcat is about 1¼ miles southeast of Winfield-Weatherby Reed City pool in the same township, and about 6 miles southeast of the newer Reynolds pool in Reynolds Township, Montcalm County, where wells are also completed in this same pay.

● A Dundee oil well was being tested natural in Akron pool, Tuscola County, at Byron A. Bartlett 1 Cosens, NE NW NE 26-14n-7e, Wisner Township. This well was spudded with its announced objective as the Richfield, and it may be deepened to that horizon if Dundee pay does not continue to perform near its present flow rate. Average production, flowing by heads from an open 6-in. hole was 78 bbl. This is the fifth well to flow better than average from the Dundee in Akron field "sour zone" and Richfield oil development, but the Bartlett 1 Cosens appeared to be the strongest of these Dundee wells on the basis of initial tests. Well is the south 40-acre offset to the Akron pool Richfield discovery well. The east 40-acre offset to the Richfield discovery was drilled out dry in that pay last week.

APPALACHIAN

WEST VIRGINIA

In Beaver district, Nicholas County, West Virginia, Nelson W. Taylor, agent, completed 1 John Mearns wildcat, gaging 381,000 cu. ft. gas, Maxon sand 1,430-76 ft. of gas 1,446 ft., TD 1,880 ft.

● Washington district, Upshur County, Washington Natural Gas Co. 1 Paul Shaw, resumed drilling after a fishing job and is now at 1,501 ft. The Big lime was recorded at 1,347 ft.

● Licking district, Tucker County, Hope Natural Gas Co. 9940 James E. Watson, is drilling at 3,301 ft.

● Allen district, Morgan County, John Fox 1-K-1 Amasa Nestor, ran the 7-in. casing at 2,410 ft.

● Sherman district, Hampshire County, M. E. Anderson 1 J. E. & B. Orndoff, is at 4,226 ft.

EASTERN KENTUCKY

In Elliott County and located on Hollbrook Branch, a wildcat drilled by R. R. Sirkle has been completed as a dry hole. The well, No. 1 Hollbrook, was drilled to a total depth of 780 ft. after finding the objective Mississippian Wier sand at 700 ft. Although showing oil in cores, formation was too tight to yield commercially.

OHIO

James Drilling Co. 1 (3) J. S. Cox, Section 13, Washington Township, Hocking County, logged the Clinton at 2,928-56 ft. with 14 bbl. oil and 225,000 cu. ft. gas natural. After fracturing, the well produced 410 bbl. and 425,000 cu. ft. daily.

● An extension of ⅓ mile to Mount Pleasant pool was completed by Mam-

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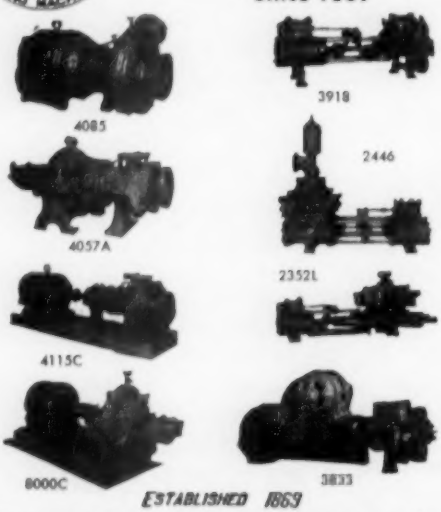

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moth Producing Co. on 1 S. E. Lee, Section 2, Swan Township, Vinton County. Clinton was found at 2,777-2,814 ft. and made 40 bbl. in a 24-hour test after treatment.

● After being shut-in for some time, Preston Oil Co. 1 Riggenbach, Section 29, Milton Township, Wayne County, was turned into the line and made 296 bbl. and 1,000,000 cu. ft. into the tank line through a ¼-in. choke in 24 hours.

PACIFIC COAST

CALIFORNIA

Long Beach Deep Pool Expanded to West

Successful exploration in the complex, highly faulted Airport area of Long Beach field is expanding productive limits westward toward the older Signal Hill area. This work has resulted in the number of rigs being increased from 4 to 12, and will probably go higher.

Key wells along the edge of the prolific 7,500 to 9,000-ft. pool were recently completed by Hancock Oil Co. and Termo Oil Co. Another western extension was recorded by Shell Oil Co. in deepening a 7,590-ft. dry hole drilled in 1951. Bottomed at 8,450 ft. 1 First Brethern Fee was completed as an 800-bbl. producer. O. Biller 1 Kessleman-Harris, about ⅛-mile beyond the Shell well, reportedly was having water difficulties but was expected to be successfully completed in oil sands between 8,206 and 8,830 ft.

Northeast of Airport pool, Standard Oil Co. of California is seeking to test a recently completed 500-acre block in the city of Lakewood. It has obtained permission of the Civil Aeronautics Authority to drill from a 17-acre site about ¾-mile north of The Texas Co.'s drill sites. Approval of the Lakewood City Council is yet to be obtained, however.

Tejon Ranch Pool Extended

Productive limits of the Jewett pool on the north edge of Tejon Ranch, Kern County, were extended about ¼-mile northwest by Intex Oil Co. 88 Blodgett-Crome. Its completion indicates another row of producers probably can be added along the northwest flank of the 1-mile anticlinal structure.

The well, located in SE SE 28-11n-19w, topped the sand at 7,245 ft. and cut some 30 ft. of oil sand in drilling to 7,330 ft. After drilling to 7,346 ft. the operator was preparing to run casing. Humble Oil & Refining Co. was

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drilling below 6,000 ft. at a west offset to the Intex well.

New Guijarral Hills Pool

Los Nietos Co., Operator 65-1 Bourdieu was completed as the discovery well in the 8,450-ft. Sanger sand at Guijarral Hills, Fresno County. On a 6-hour pumping test it produced 33°-gravity crude at a 150-bbl. daily rate. Several wells tested the sand en route to the 10,500-ft. Eocene sand but none were completed in the new pay. Standard Oil Co. of California 54 1-H in 1-21s-16e, a northwest offset, was in process of being completed in the Sanger.

Glenn Test Blows Out

A wildcat 2 miles west of Beehive Bend field, Glenn County, was brought under control after it cratered and blew gas for 3 days. The test, General Petroleum Corp. 1 Hill-Elvidge in 9-19n-2w, was bottomed at 5,321 ft. in a high-pressure gas sand. Blow-out prevention controls functioned properly but gas blowing from a nearby water well created two 40-ft. wide craters.

WESTERN CANADA

ALBERTA

Basal Quartz Gas Flowing At Ankerton Discovery

A wildcat in the Ankerton area, 30 miles southeast of Camrose town, found a moderate flow af gas in the basal Quartz formation. This test, Banff 15-4 Ankerton, LSD 15, 4-44-16w4, also recorded a small show of gas in the Viking sand.

The basal Quartz was tested at 3,361-91 ft. Gas flowed at the estimated rate of 1,000 M.c.f. per day. Recovery consisted of 125 ft. heavily oil-cut salt water and 720 ft. salt water. Crew is testing the detrital zone, bottomed at 3,576 ft.

Rolling Hills wildcat . . . Medium-gravity oil has been discovered by Canadian Export Gas, Ltd., at its current driller in the Rolling Hills of southern Alberta, 21 miles south of Brooks and 105 miles southeast of Calgary.

This test, Canadian Export 10-22 Rolling Hills, LSD 10, 22-15-14w4, ran discovery drill-stem test in the Mississippian lime at 3,285-3,320 ft. Recovery consisted of 1,150 ft. clean oil and 120 ft. oil-cut mud. Crew ran production casing and hole is currently standing cemented before carrying out evaluation tests.

SASKATCHEWAN

Light Gravity Oil Found At Antler River Wildcat

Imperial Oil, Ltd., has discovered light gravity oil in the Mission Canyon member of the Mississippian at a wildcat in the Antler River area of southeastern Saskatchewan. This well, Imperial-Gridoil 16-7 Hastings, is being drilled 4 miles northwest of the Imperial 8-34 Antler River discovery well and 8¾ miles southwest of Alida field. Location is on LSD 16, 7-4-33w1.

On a series of tests, covering a 25-ft. zone in the Mission Canyon, recoveries of 800 ft. of clean oil were reported. Crew was drilling ahead last week.

ROCKY MOUNTAIN

NORTH DAKOTA

New Bottineau County Discovery Tested

Lion Oil Co. has tested an apparent Mississippian discovery 6 miles northeast of existing production in Bottineau County. The well is 1 Skarphol, C SE SW 33-16n-77w. Test at 2,972-88 ft. recovered 2,190 ft. of oil in 3 hours.

Flowing pressure on the test was 610 psi. at the end of the 3-hour period, and shut in pressure was 1,275 psi. Top of Mission Canyon was found at 2,971 ft. The first test in the wildcat was of the interval 2,913-75 ft., with recovery of 95 ft. of oil and gas-cut mud in 3 hours.

The well is ½ mile east of a dry hole drilled in 1954 on acreage farmed out by Lion. It is immediately south of the Canadian border, and 7 miles east of Northeast Landa field. There has been no other drilling in the immediate area. Lion was last reported coring below 2,988 ft.

The well is regarded in North Dakota as the state's most important development of recent months. It is the easternmost producer in the U. S. portion of the Williston basin. The drill-stem test recovery compares very favorably with other tests in previous Bottineau County discoveries, particularly since no water was recovered with the oil.

Lion has not been active in its own right in the area, but has followed a practice of farming out holdings to other operators. Almost concurrently with announcement of the favorable test at the apparent discovery the company has reported location for a new Bottineau County wildcat. It is 1 Wallace, C NW NW 14-162n-76w, 10 miles southeast of the apparent discovery. It will test to Nisku at about 4,000 ft.

Lion Oil Co. has an apparent Mission Canyon oil discovery 7 miles east of production in Bottineau County.

WYOMING

Park County Discovery Completed

Mobil Producing Co. gaged a flow of 80 bbl. of oil per day through 18/64-in. choke at completion of T-61-12-P, NE NW NE 12-56n-100w, Dakota discovery on the Bearcat unit, Park County. Production is from the interval 7,942-50 ft. Oil is 46° gravity. The well is the second drilled on the unit. The first was a deep test which reported shows in Dakota as well as in Phosphoria and Tensleep but was abandoned after tests. The recently completed discovery recovered oil on tests of Phosphoria, but in noncommercial volume.

Torchlight Area Wildcat Recovers Madison Oil

Stanolind Oil & Gas Co. swabbed 13 bbl. of oil in 2 hours after acidizing Madison at 1 Government, E½ NE NE 23-51n-93w, in the Torchlight area, Big Horn County. The well is 1½ miles from previous Madison production in the area. Stanolind had apparently commercial recoveries of oil from Phosphoria and Tensleep as well as Madison and has plugged back for tests of Tensleep.

Lance Creek Morrison Producer Completed

Ohio Oil Co. reported a completion gage of 170 bbl. of oil per day at 11 Converse, SE SE SW 32-36n-65w, in the Lance Creek field, Niobara County. The well is reported the first Morrison producer in the field. The Lance Creek discovery was made in 1918, with production from Muddy. Since that time producing zones as old as Pennsylvanian were added. Morrison satura-

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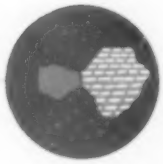

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tion has been found in previous drilling with no completions attempted in the zone.

Bearcat Unit Apparent Discovery Tested

Mobil Producing Co. gaged a flow of 106 bbl. of oil in 23 hours at T-61-12-P, NE NW NE 12-56n-100w, Park County. The well was fractured in the Dakota zone 7,942-50 ft. before test. It is now shut in for storage. Earlier tests of Phosphoria in this well recovered oil at the rate of 57 bbl. per day, but the operator plugged back for completion in Dakota.

MONTANA

Yellowstone County Discovery Drilling Ahead

Atlantic Refining Co. is drilling below 6,176 ft. at 1 Horton estate, C SE SW 18-7n-32e, in the Wolf Springs area of Yellowstone County. The well flowed oil after 15 minutes of a 26-minute test on test previously reported. The successful test was at 6,110-25 ft. Another test 6,128-76 ft. recovered 10 ft. of oil and 95 ft. of heavily oil and gas-cut mud. Production is from Amsden dolomite. The well was originally scheduled as 7,500-ft. test of Mission Canyon. The operator has not stated whether drilling will be continued to that depth. Production from the Amsden dolomite is developed in Rosebud County's Northwest Sumatra field, 24 miles north of the Atlantic discovery. Several porosity zones also produce in this field, indicating the likelihood that similar zones will be tested in the Wolf Springs area discovery.

Confirmation to East Bredette Discovery Readied

The California Co. has made location for 1 Tribal-13, C SW NW 19-32n-50e, intended confirmation of the company's recent discovery in the East Bredette area of Roosevelt County. The discovery, 1 Grimm, C NE SE 19-32n-49e, in continuing to test. At last reported test recovery through ⅛-in. choke in 24 hours was 137 bbl. of oil per day. Total fluid recovery was 13 per cent water. The discovery found production in Madison at 6,537-45 ft.

Gas City Discovery Completed

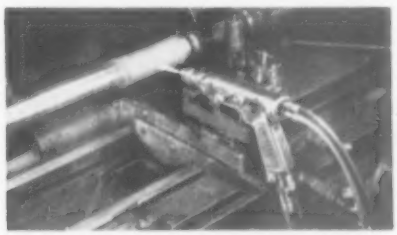
Shell Oil Co. has completed 33-X-21, NE NW SE 21-14n-55e, in the Gas City area, Dawson County. Final gage was 202 bbl. of oil and 5 bbl. of water

Colmonoy No.6 hard-faced Slush Pump Rods stay in service Five Times Longer!

Prevent unnecessary shutdowns to replace worn rods and packing. Use rods that are hard-faced with COLMONOY No. 6. This miracle alloy has great resistance to abrasive and corrosive conditions, and is so smooth it reduces stuffing box repacking to a new minimum.

COLMONOY No. 6 is sprayed on in powder form, making a smooth, even overlay. This is *welded* to the rod with an oxy-acetylene flame. Only finish grinding is needed to put the part into service, to last 5 times as long as it would before hard-facing.

COLMONOY No. 6 is used on various pump and valve parts throughout the producing field and the refinery. Write us for the name of your nearest shop doing Spraywelding.



Above is a pump rod being Spraywelded with Colmonoy No. 6. At left is a slush pump rod that has been hard-faced with Colmonoy No. 6.

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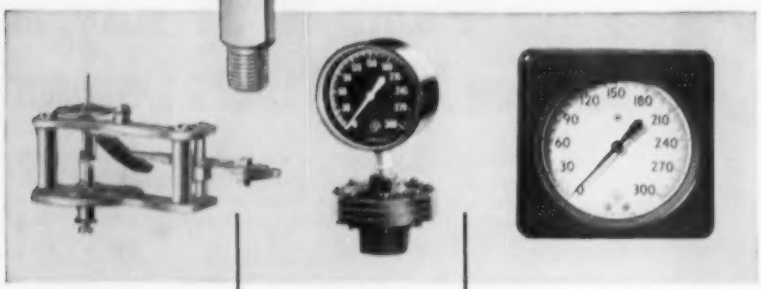

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per day through 24/64-in. choke. Production is from Red River at 9,092-9,186 ft. No attempt at evaluation of apparently commercial zones in Silurian and Mission Canyon has been made since casing was landed in this well. The discovery is 2½ miles southeast of Yellowstone field.

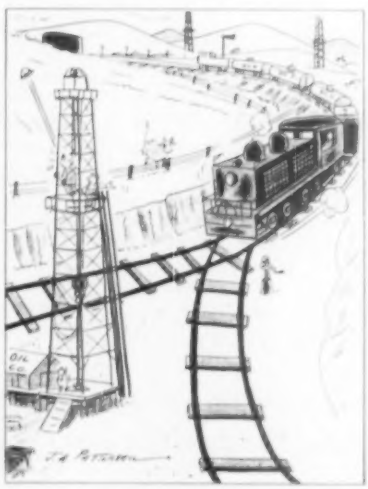
Two Rank Williston Basin Wildcats Staked

Amerada Petroleum Co. has made location for a wildcat in the Outlook area of Sheridan County, in an area which has had no previous drilling, and which is rank even by standards of the eastern Montana portion of the Williston basin. The well is 1 Lander, SW SW 21-37n-53e. It is to test Mississippian at about 6,500 ft.

The Amerada well was one of two recently announced rank wildcats in eastern Montana. Earl M. Cranston of Billings has also made location for a wildcat 9 miles southeast of East Poplar field in Richland County. It is 1 Government, W½ NW NE 26-27n-53e. There has been no previous drilling in this area.

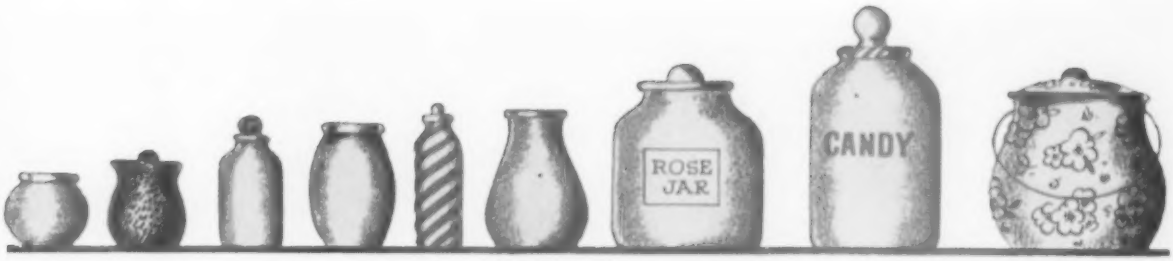
Glacier County Wildcat Recovers Oil From Madison

Kuhlberg, Otthouse and Halbert & Jennings recovered 1,420 ft. of clean oil with 60,000 cu. ft. of gas per day on test of 1 Vasboe, C NW NW 35-37n-5w, in Glacier County. The wildcat is north of Cutbank field. Test was of Madison at 2,731-49 ft. Times and pressures were not reported on the test, but the recovery was considered significant in that Madison in this general area usually does not produce prior

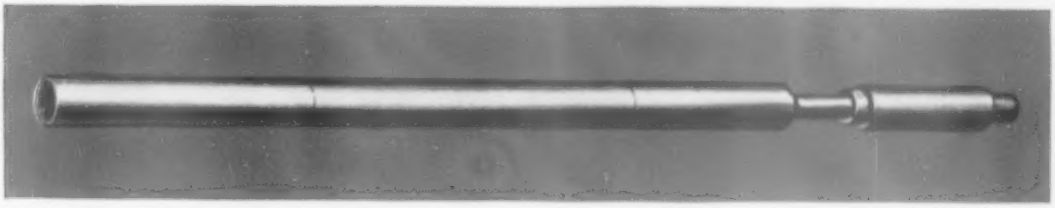


"Oh calm down, you'll get used to it."

there are all kinds of JARS!



but there's only one...



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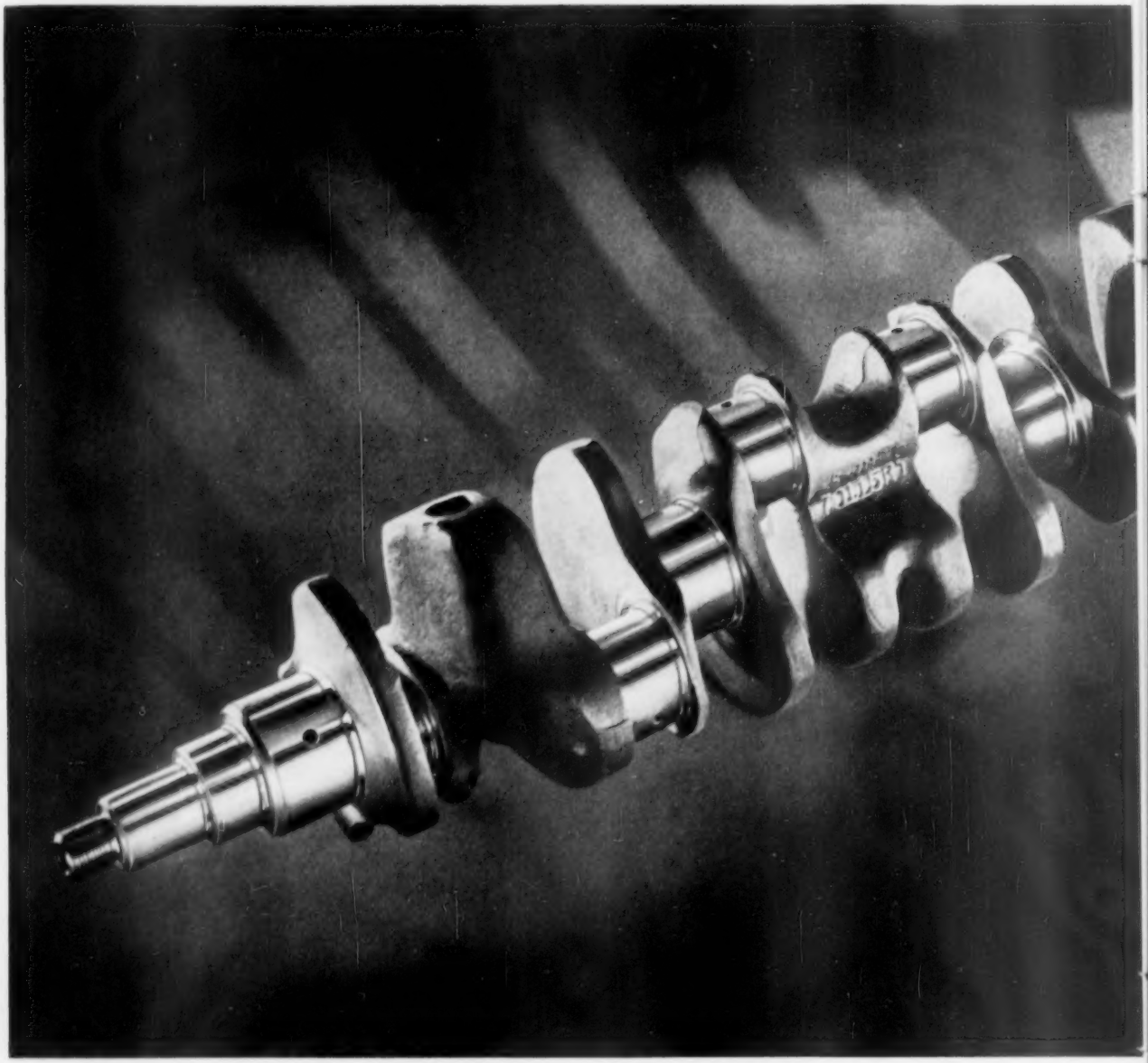

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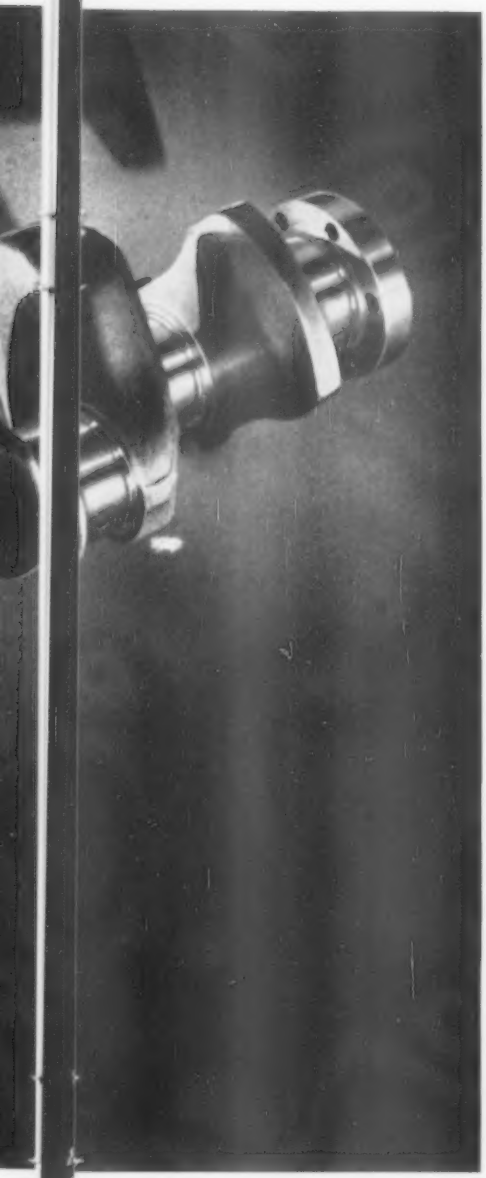

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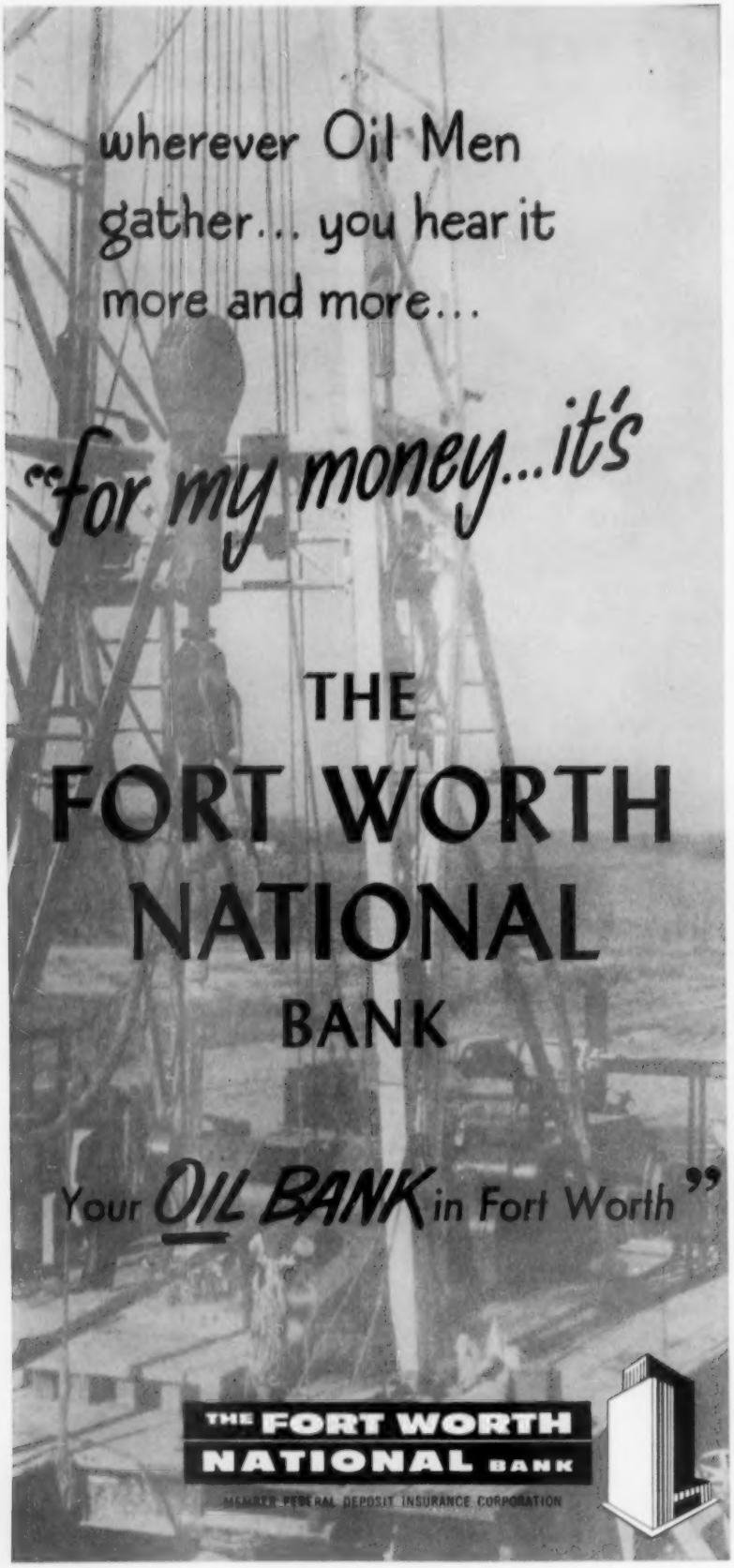

to treatment. Operators were running logs at last report.

NEBRASKA

Kimball County Discovery Near Completion

Baird Pfeifer Drilling Co. has run pipe and is preparing to perforate and test an apparent discovery 2 miles north of Sisson field in western Kimball County. The well is 1 Anderson-Forbes, C NW NW 6-12n-58w. On drill-stem test at 7,277-97 ft. recovered was 1,230 ft. of oil, 180 ft. of oil-cut mud and 360 ft. of fresh water. Tool was on 2 hours, 25 minutes, with flowing pressure of 620 psi. at the end of the test. Test was in "J" sand where a total of 15 ft. of apparently productive sand was cut in core. There is no previous drilling in the immediate area.

New Pay Tested In Chaney Field

Tom Palmer, Inc. recovered 2,640 ft. of clean oil and 60 ft. of mud-cut oil on drill-stem test in "J" sand at a Chaney field location in Kimball County. Test was of 3 Joska, C SE NE 28-13n-57w, in the interval 7,045-59 ft. Tool was open 1 hour. Previous production in the field is from "D" sand.

COLORADO

Weld County Permian Discovery Near Test

The California Co. is preparing to perforate at 1 Priddy, C NW SW 23-8n-66w, Weld County. Casing was landed at 9,257 ft. in the wildcat, which is just north of the town of Pierce, and slightly more than 4 miles northeast of production from Lyons (Permian) at Black Hollow field. The operator recovered 2,900 ft. of oil on 3-hour test at 9,161-80 ft., later cored additional saturation below this interval, with no water reported in the formation.

UTAH

Grand County Apparent Discovery Tested

Three States Natural Gas Co., and others recovered 250 ft. of oil and 230 ft. of mud on 3-hour 20-minute test of Dakota at 1 Cullen-Government, NE NE NE 15-20s-23e, in the Cisco Springs area of Grand County. Flowing pressure was 150 psi. Test was of the interval 1,552-90 ft. The well is 8 miles southwest of a recent discovery in the

Seiber Nose area by Carter Oil Co. The Carter discovery produced from Morrison.

North Boundary Butte Discovery Completed

Shell Oil Co. has completed its discovery at 1 North Boundary Butte, C SW NE 33-42s-22e, San Juan County. Completion was in two zones of Paradox (Pennsylvanian). The interval 4,688-4,750 ft. flowed 375 bbl. of oil with 2,670,000 cu. ft. of gas per day on 24/64-in. choke. The zone 5,108-5,282 ft. flowed 117 bbl. of net oil with 1,565,000 cu. ft. of gas per day. Top of Paradox was called at 4,957 ft. The well is 5 miles southwest of Shell's 1954 discovery at Desert Creek.

Successful Wildcats

WEST TEXAS

Pecos County: Liedtke & Liedtke 1 Humble-Shearer, 43-20-H&GN, 7 mi. SE Impe-

Townsite drilling in the new West Snyder field, Scurry County. This rig is Thompson-Powell-Derrick Co. 2 York "B," west of Snyder, and southeast of the firm's 1-B York, discovery which flowed up to 20 bbl. of oil an hour from reef pay. Projected depth is 6,800 ft.

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rial. IP 47 BOPD, ⅛-in., TP 340 psi., GOR 400, 34°, pay 1,840 ft. TD 1,891 ft.

Runnels County: Superior Oil Co. 1-A McCaughan, Sec. 440, Lot 16, T. M. Fowler Sur., 2 mi. NE Norton. IPP 35 BOPD, 44.9°, GOR 430, Gardner 4,679-82 ft. TD 4,870 ft.

SOUTHWEST TEXAS

Atascosa County: Frio Production Co. 1 Easterwood, Block 441, Simmons Sub., Sec. 29. IPP 51.98 BOPD, 2 per cent water, 20°, Queen City 1,597-1,601 ft. TD 1,798 ft. (New pay in South Imogene field.)

TEXAS GULF COAST

Bee County: John B. Hawley, Jr., 1 McKenzie, C. A. Dugat Sur., A-321. IP 195 BOPD, ¼-in., 47°, perforations 3,601-08 ft. TD 3,977 ft. (New pay in West Cosden field.)

Burleson County: Oak Oil Co. 1 Boyd & Eanes, M. P. Kelly Sur., A-20. IPP 60.5 BOPD, 32°, perforations 3,546-70 ft. TD 3,951 ft. (New field—2 miles northwest of Chriesman.)

Chambers County: The Texas Co. 1 State, Tract 107, Trinity Bay. IP 106.67 BOPD (net), ⅛-in., 42 per cent water, 33.8°, perforations 11,495-11,528 ft. (Frio) TD 11,532 ft. (New field—East Smith's Point.)

Nueces County: Ray M. Southworth 1 Harper, Sec. 64, George H. Paul Subd., Driscoll ranch. IP 78.12 BOPD, ¾-in., 36.4°, perforations 5,904-14 ft. TD 7,023 ft. (New pay in West Minnie Boch field.)

Refugio County: Humble Oil & Refining Co. 1 Welder heirs, Martin Power Sur., A-52. IP 9,000 M.c.f. daily, open-flow potential, SIP 1,933 psi., perforations 5,064-70 ft. TD 7,000 ft. (New field—5 miles west of Woodsboro.)

Wharton County: Texas Gulf Sulphur Co. 1 Hudgins, Alexander Jackson Prairie Lge., A-34. IP 72,000 M.c.f. daily, open-flow potential (2,554 M.c.f. daily, ¾-in.), SIP 1,848 psi., upper Frio 4,766-76 ft. (perforations). TD 7,540 ft. (Extends Spanish Camp field.)

EAST TEXAS

Gregg County: Carter-Jones Drilling Co. 1 Stinchcomb, Isaac Lee Sur., 2 mi. W Easton. IPP 4,500 M.c.f. gas, plus 30 bbl. distillate per 1,000 M.c.f., "A" zone of the Pettit, 7,000-37 ft. TD 7,160 ft.

TEXAS PANHANDLE

Hansford County: Producers Chemical Co. 57-1 Steele, C SW SW Block 45, Sec. 57, H&TC Sur. IP 4,500 M.c.f. of gas per day, Tonkawa-Missouri sand 5,171-74 ft. TD 7,166 ft. (Gas discovery.)

WEST CENTRAL TEXAS

Callahan County: N. M. Dillard 1 Baum, A. Montgomery Sur. 853, 3 mi. W Cross Plains. IP 140 BOPD, 16/64-in., 42°, GOR 460, Cross Plains sand 1,606-20 ft. TD 1,656 ft.

Coleman County: Addison Warner 1 Clayton, Blk. 54, Burnett CSL Sur., 1½ mi. NW Valera. IP 221 BOPD, 20/64-in., 45°, TP 120 psi., GOR 675, lower Gardner 3,058-80 ft. TD 3,080 ft.

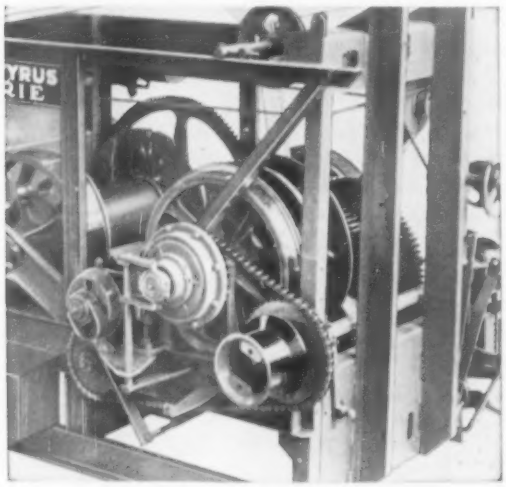
Eastland County: J. E. Connally 1 Lampkin, T. H. Mulryne Sur., A-377, 6 mi. N Gorman. IP 76 BOPD, 16/64-in., 41.9°, TP 325 psi., GOR 960, Ranger lime 3,149-52 ft. TD 3,288 ft.

Jones County: Creslenn Oil Co. 3 Threadgill, Subd. 5, J. M. McKissick Sur. 208, 6 mi. SW Anson. IPP 111 BOPD, 42.5°,

Hi-Performance 60-L Spudder Makes Secondary Recovery Work Pay Dividends

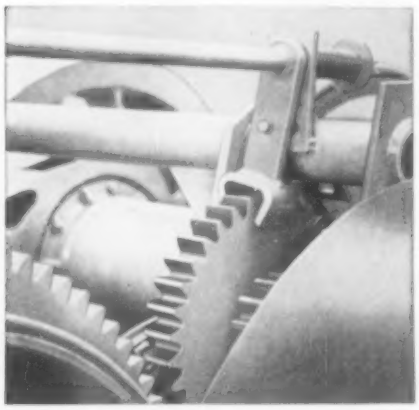
High Bailing Speeds Essential

Chain-driven sand reel is built particularly for speedy handling of bailing operations. It has independent clutch control and is free-wheeling. The clutch is disengaged when the bailer is lowered into the hole, greatly increasing speed of operation. Average hoisting speed is about 800 feet per minute.



Reduction in Hoisting Speed for Swabbing

Another operation at which the 60-L excels is swabbing the hole. This rig is equipped to swab to depths of 2,000 feet with either the sand reel or the bull reel, depending upon the load to be hoisted. A simple speed reducer for the bull reel hoist, controlled by the same friction clutch as the regular high speed hoist, increases pull on swabbing line to 2½ times that obtained with the high speed hoist. Swabbing unit is optional equipment at extra cost.



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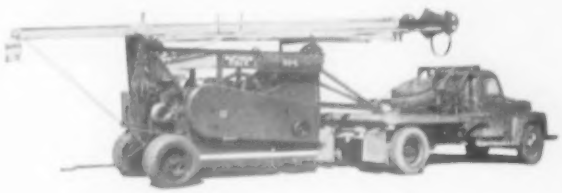

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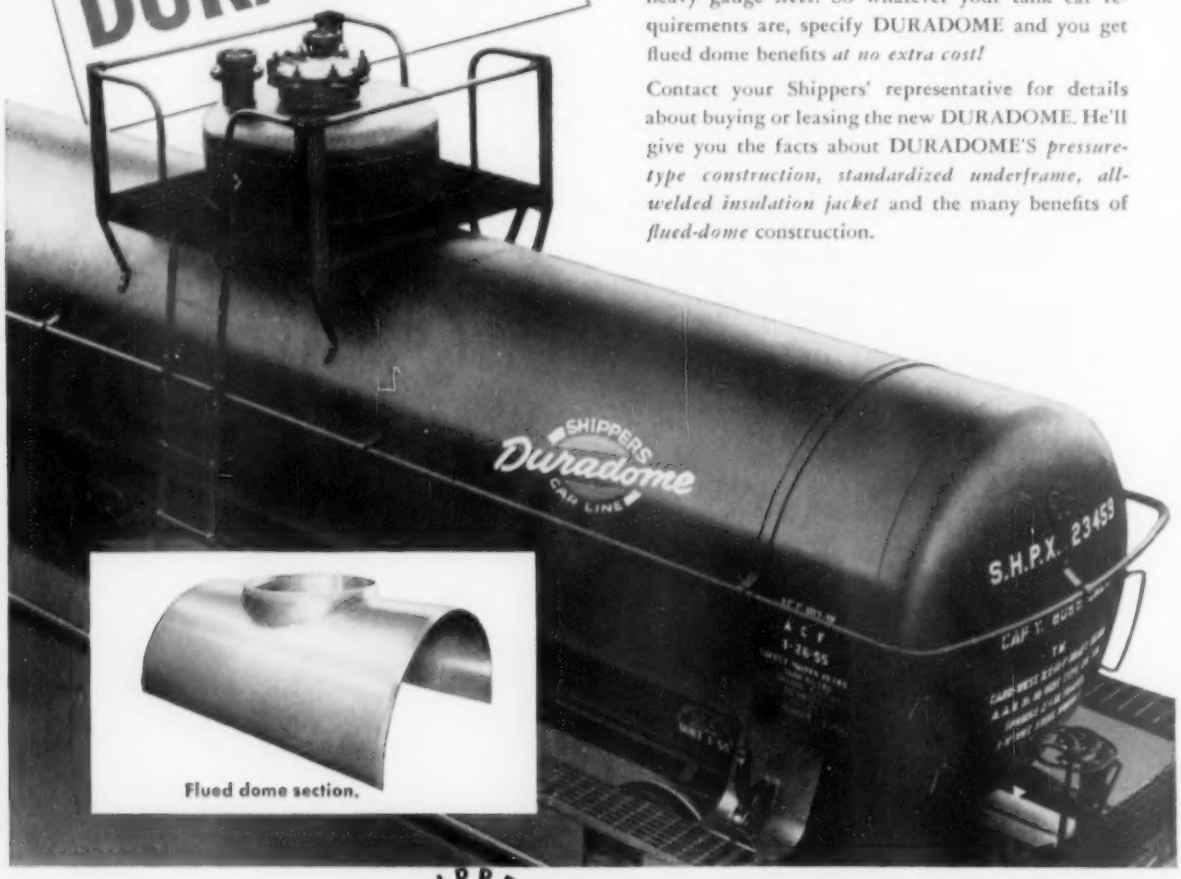

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GOR 717, upper Strawn 4,589-95 ft. TD 4,724 ft.

Stonewall County: American Trading & Production Co. 1 Lendhorst, 354-D-H&TC, 5 mi. NW Peacock. IPP 24 BOPD, 39°, Ellenburger 6,668-70 ft. TD 6,899 ft.

NORTH TEXAS

Archer County: John F. O'Donohoe 1-B Miller, Lazarus Ranch, McKinney & Williams Sur., Blk 6, ½ mi. N Mankins. IP 65.5 BOPD, 10/64-in., 40°, TP 110 psi., GOR 300, pay 4,306 ft. TD 4,332 ft.

Grayson County: Russell I. Chiles, Sec. 26, W. G. Washington Sur., A-1522, 1½ mi. SW Pottsboro. IP 68 BOPD, 16/64-in., 34°, TP 50 psi., GOR 500, pay 8,147 ft. TD 8,320 ft.

Jack County: Ada Oil Co. 1 Kinder, E. Pierce Sur., A-467, 6½ mi. S Jacksboro. IP 3,000 M.c.f. gas, open flow, pay 4,692-4,704 ft., shut-in pressure 1,352 psi. TD 5,046 ft.

M. E. Andrews 1 Richards, John Watkins Sur., A-881, 7 mi. NW Perrin. IP 4,750 M.c.f. gas, ⅜-in., TP 1,475 psi., shut-in IP 2,250 psi., pay 5,130-39 ft. TD 5,192 ft.

Charles Kadane 1 Lewis, H. Martin Sur., A-383, 5½ mi. SE Cundiff. IP 210 BOPD, 16/64-in., TP 580 psi., 44°, GOR 630, conglomerate pay 5,040 ft. TD 5,066 ft.

NORTHWEST NEW MEXICO

Rio Arriba County: R & G Drilling Co. 4 R&G, SE NW SW 3-24n-5w. IP 1,000 M.c.f. of gas per day, Pictured Cliffs sand discovery, new gas field. TD 2,606 ft. Pictured Cliffs.

SOUTHEAST NEW MEXICO

Lea County: Amerada Petroleum Corp. 1 State SRA, 14-9s-32e. IPP 275 BOPD, 40°, Devonian 11,103-30 ft. TD 11,177 ft., elev. 4,346 ft.

WEST VIRGINIA

Nicholas County, Beaver district: Nelson W. Taylor, agent, 1 John Mearns, elevation 2,219 ft., 381,000 cu. ft. gas, Maxon sand 1,430-76 ft., gas, 1,446 ft., TD 1,880 ft.

KENTUCKY

Henderson County: Kennard Oil Co. 1 Cavanah, NE NW NE 10-Q-24. IPP 180 BOPD, Aux Vases 2,202-11 ft. TD 2,376 ft. (Discovery of Henderson pool.)

MISSISSIPPI

Wilkinson County: Calto Oil Co. 1 Crosby, SW SW 13-3n-1w. IPP 55 BOPD (net), plus 220 BWPD, 39°, Wilcox 5,352-54 ft. (perforations). TD 7,908 ft. Elev. 272 ft., top Wilcox 5,351 ft. (New field—Mud Creek.)

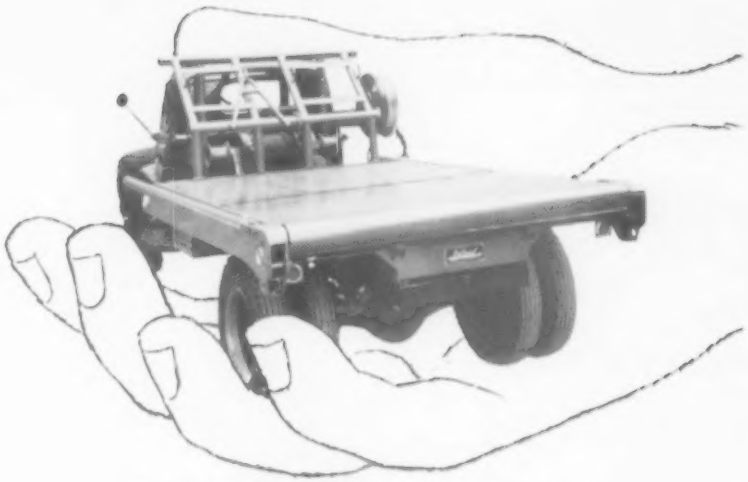
SOUTH LOUISIANA

Lafourche Parish: Sun Oil Co. 43 Diebert, Stark & Brown, 59-15s-15e. Shut-in gas-condensate well, tested through ⅝-in. choke, ungaged, TP 3,100 psi., perforated 13,096-13,106 ft. TD 15,017 ft. (Extends Chacahoula field—2 miles northwest of production.)

The Texas Co. 167 LL&E, 4-22s-22e. IP 195 BOPD, X-31 choke, 29.5°, perforations 14,238-58 ft. TD 15,469 ft. (Extends Leeville field.)

John W. Mecom and Freeport Sulphur Co. 3 Jones et al, 46-17s-21e. IP 32 BCPD and 1,830 M.c.f. daily, 5/32-in., 52°, perforations 10,832-55 ft. TD 12,500 ft. (New pay in La Rose field.)

Vermilion Parish: Sinclair Oil & Gas Co. 1 Broussard et al, 90-14s-3e. IP 52,000 M.c.f. daily and 25.7 BC per M.M.c.f., open-flow potential, 46.1°, TP 4,750 psi.,



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SIP 4,865 psi., perforations 13,174-82 ft. TD 13,268 ft. (Extends, and new pay in Live Oak field.)

NORTH LOUISIANA

Claiborne Parish: Stanolind Oil & Gas Co. 1 Bill Unit, 1¼ miles northeast of Bayou Middle Fork field in C SW NE SE 5-22n-5w. IPF 418 BOPD, 10/64-in. choke, 47.4°, GOR 690:1. Smackover "A" zone 10,220-10,386 ft.; 249 BOPD, 12/64-in. choke, 59.8°, Smackover "B" zone 10,506-10,649 ft. (Dual oil discovery of Mt. Sinai field.)

OKLAHOMA

Stephens County: Arthur Finston 1 Maxwell, SW SW NW 10-2n-5w. IPF 210 BOPD, Elgin sand 3,974-86 ft., 43°, 15/64-in. choke. TD 6,020 ft. (Oil discovery.)

KANSAS

Harper County: Superior Oil Co. 1 Williams, NW SW NW 22-31s-8w. IPP 81 BOPD, Mississippian 4,426-36 ft., 31°. TD 4,476 ft. (Opens Grabs pool.)

Kingman County: Bay Petroleum Co.-Virginia Drilling Co. 1 McCutcheon, NE NE NW 10-27s-7w. IPP 99 BOPD, Viola lime 4,105-07 ft., 40,. TD 4,290 ft. (Opens McCutcheon pool.)

Morton County: Musgrove Petroleum Co. 1 Jones, C SE NW 11-35s-43w. IP 2,579 M.c.f. of gas per day, Keyes sand 4,558-72 ft. TD 4,712 ft. (Gas discovery.)

Sedgwick County: Petroleum, Inc. 1 Howell, CW½ NW SW 5-29s-1e. IPP 33 BOPD, Miss. 3,194-3,210 ft. TD 3,240 ft. (Discovery of South Gladys pool.)

KANSAS (NEW POOL NAMES)

Barber County: Globe Oil Co. 1 Goemann, NW NE NW 29-32s-10w. IP 16 BOPD, 2,000 M.c.f. of gas per day, Mississippian. (Opens Goemann pool.)

Trans Era 1 McReynolds, NW NW NW 30-31s-10w. Mississippian discovery. (Opens McReynolds pool.)

Barton County: Leben Oil Co. 1-B Hiss, NW SW NW 17-19s-14w. Arbuckle oil discovery. (Opens West Heizer pool.)

McKnab Drilling Co. 1 Nuss, SE SE NW 5-16s-14w. Lansing discovery. (Opens Nuss pool.)

Decatur County: Sauvage Drilling Co. 1 Stony, SW SW SW 27-2s-28w. Lansing discovery. (Opens East Jorn pool.)

Ellsworth County: Henderson Oil Co. 1 Borecky, NE SW NE 4-16s-10w. Arbuckle discovery. Opens Northwest Progress pool.)

Graham County: R. W. Shields 1 Tremblay, NW NW NE 3-9s-21w. IP 73 BOPD, Penn. conglomerate (basal). (Opens North Morel pool.)

Jones, Shelburne & Farmer 1 Brown, SW SW SW 19-6s-25w. Lansing discovery. (Opens Allodium pool.)

George Kaiser 1 Keith, NE NE SW 32-8s-24w. Lansing discovery. (Opens Northwest Holley pool.)

Harper County: Champlin Refining Co. 1 McIntire, NW NW NW 1-31s-8w. Mississippian discovery. (Opens Southeast Spivey pool.)

Kingman County: Bay Petroleum-Virginia Drilling Co. 1 McCutcheon, NE NE NW 10-27s-7w. Viola discovery. (Opens McCutcheon pool.)

Kiowa County: Amer and NCRA 1 McKinley, SE SW NE 11-28s-20w. Mississippian discovery. (Opens Mullinville pool.)

Marion County: Chas. Carlock 2 Unger, SW SW NE 8-21s-3e. Hunton oil discovery. (Opens Unger pool.)

Meade County: Colorado Oil & Gas Co. 1-3 Leslie, C SW NE 3-33s-30w. Morrow discovery. (Opens Leslie pool.)

Rice County: Riggs & Stagg Drilling Co. 1 Newkirk, SW SW SW 1-18s-7w. Basal Penn. conglomerate discovery. (Opens Northwest Crawford pool.)

Rooks County: Lee Phillips et al 1 Flagler, SW SW NE 15-10s-18w. Lansing discovery. (Opens Flagler pool.)

Sedgwick County: E. H. Adair 1 Blood, S½ N½ NW 4-29s-1e. Mississippian discovery. (Opens Southeast Gladys pool.)

Time Petroleum 1 Dugan, SW SW NE 18-28s-1w. Miss. discovery. (Opens South Schulte pool.)

Trego County: Wick Petroleum 1 Wagoner, C NE SE 35-14s-21w. Marmaton discovery. (Opens Southeast Groff pool.)

WYOMING

Park County, Bearcat Unit: Mobil Producing Co. %-61-12P, NE NW NE 12-56n-100w. IPF 80 BOPD, Dakota sand oil discovery. TD ? in Phosphoria.

COLORADO

Logan County, Sterling: Dietler & Oleson, Slick Oil Co., Ltd., 1 State, C NW NE 2-7n-52w. IP 1,000 M.c.f. of gas per day from the "D" sand; 2,500 M.c.f. per day from "J" sand. TD 4,572 ft. "J" sand. (Gas discovery, new field.)

ALBERTA

Socony 36-10 Calgary, LSD 10, 36-24-29w4. D1 gas well. TD 8,750 ft.

Socony-CPR 1-14 Redland, LSD 14, 1-28-22w4. Viking gas well. TD 5,118 ft.

MANITOBA

McCarty & Coleman 12-15 Maon, LSD 12, 15-9-25w1. Miss. oil well. TD 2,100 ft. 3-33 Routledge, LSD 3, 33-9-25w1. Miss. oil well. TD 2,080 ft.

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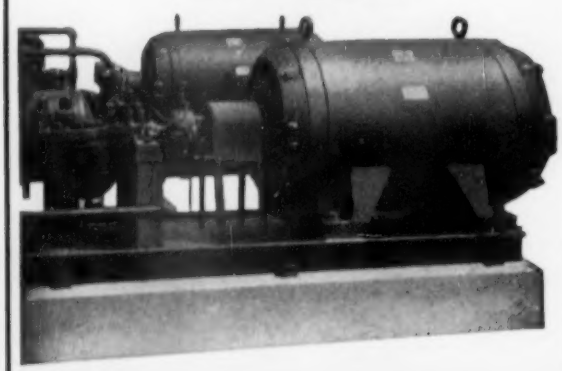

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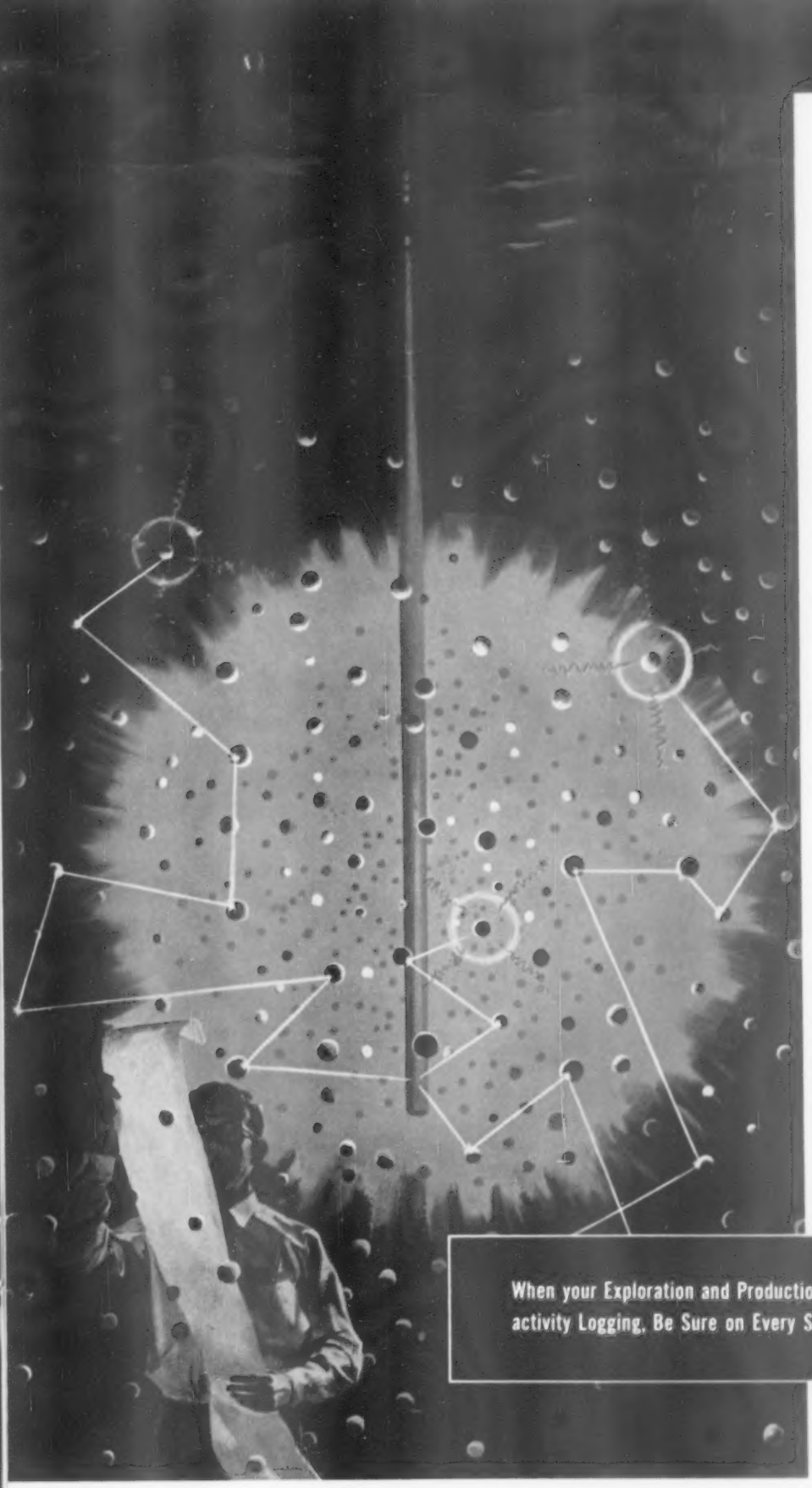

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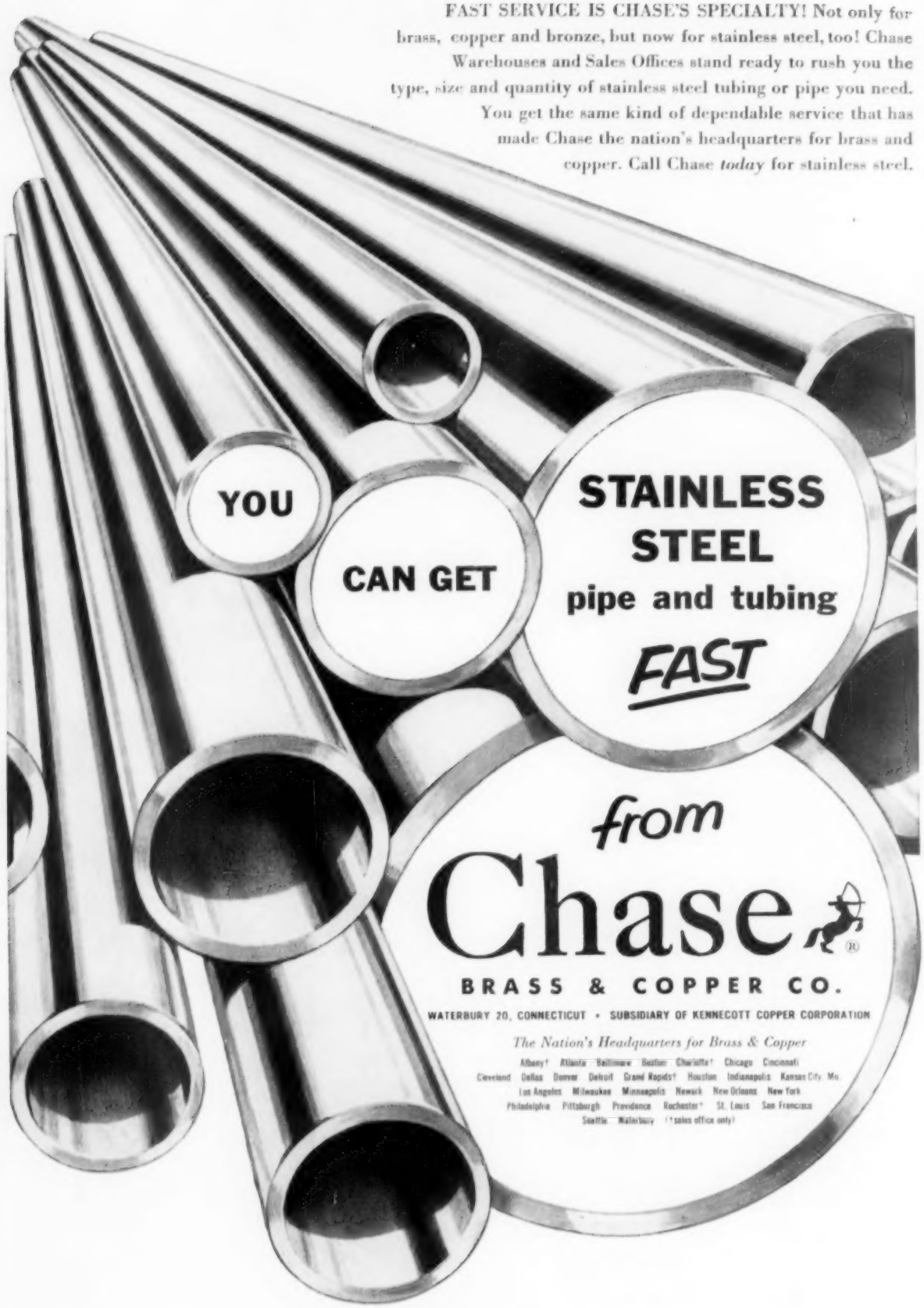
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PERSONALS

Oil Man by Tradition

Bishop president following lead of father, grandfather

THE family tree of William Wallace (Tommy) Mein, Jr., has its roots in mining and its branches in oil.

In 1860 Thomas Mein, Tommy's grandfather, was manager of one of the largest gold mines in California's Mother Lode. His son, William Wallace Mein, literally grew up in the gold diggings, working as a young man with his father. At the age of 30 he became manager of the world's top producing Robinson Mine at Johannesburg, South Africa. And in 1920, anticipating the Los Angeles Basin as an oil-producing center, Mein founded Bishop Oil Co.

Guiding the affairs of Bishop Oil today is the third generation of this California family, William Wallace, Jr. Mein is also president of the company's wholly owned subsidiary, Canadian Bishop Oil, Ltd., and of Calaveras Cement Co.

Tommy Mein was born in London in 1910 while his parents were en route from South Africa to their home in California. He was graduated from Harvard College in 1932 with an A.B. degree in engineering sciences.

Oil career . . . He soon acquired a first-hand knowledge of the practical side of the oil industry by working with Bishop both in the home office and in the field. In 1934 and 1935 he was a geologist for the company in the Mid-Continent. He later was stationed in South Texas, and still later was transferred to Ada, Okla., as a scout during the boom days of the Fitts oil field.

In 1938 Mein was elected a director of Bishop and in 1943 he became vice president. In 1952 he took over the reins of Canadian Bishop Oil, Ltd. He has been president of Calaveras Cement since 1951. Two years ago he succeeded his father as head of the parent Bishop Oil in San Francisco.

Industry activities . . . He was recently elected to a 3-year term as vice president of the American Institute of Mining, Metallurgical and Petroleum Engineers. He also is a member of the American Petroleum Institute, Canadian Institute of Mining and Metallurgy, and the Independent Petroleum Association of America.

Long active in programs to improve conditions in the oil and mining industries, he served from 1944 to 1954 as secretary of the California State Mining Board, through appointment by Gov. Earl Warren. He served on the National Minerals Advisory Council of the U. S. Department of the Interior in 1950, and on the Natural Resources Committee of the United States Chamber of Commerce in 1951. Recently he was appointed to the Conservation Committee of the National Association of Manufacturers.

Mein is married to the former Sally Miller Nickel of San Francisco. They have four children: Bill, 19; Tommy, 17; Nicky, 12; and Tina, 6. The family lives in Woodside, on the San Francisco Peninsula, where Mein recently completed three consecutive terms as a Woodside School trustee.

James H. Marks, operating manager of Equitable Gas Co., Pittsburgh, was elected vice president in charge of operations at a recent meeting of the board of directors. Marks will have charge of the automotive equipment, distribution, compressor stations, land and real estate, production and transportation, and system operation departments.

Ralph L. Gray has replaced **H. G. Ellis** as district superintendent for Buffalo Oil Co. in Artesia, N. M. **B. J. Hinson,** district engineer, has been promoted and transferred to the main office in Tulsa and has been succeeded in Artesia by **Max E. Curry,** formerly with Skelly Oil Co. **Vincent Foster** has joined Buffalo as a petroleum engineer in the Artesia district. **Turner Wynn,** Buffalo geologist, has been transferred from Midland, Tex., to Artesia.

J. C. Thompson, district geologist for Pan-Am Southern Corp. in El Dorado, Ark., has retired and will establish his own independent geological consulting office in El Dorado. Thompson has been with Pan-Am Southern and its predecessor, Root Petroleum Co., in El Dorado since 1928.

Jack W. Hudson and **Harry Dernick** have become president and vice president, respectively, of the recently

J. W. HUDSON

H. DERNICK

formed Production Management, Inc., in Denver. Hudson had been, in turn, chief engineer, superintendent of drilling, and general superintendent of Deep Rock Oil Corp. Dernick had been district engineer, chief primary engineer, and assistant chief engineer in charge of oil and gas engineering and evaluation for Deep Rock.

William Sloan, Ohio Oil Co., Bismarck, N. D., was elected a vice president of the North Dakota Oil and Gas Association to replace **W. W. Simpson,** recently transferred to Tulsa. Newly elected directors of the association are **C. W. Day, Jr.,** Sohio Petroleum Co., Billings, Mont.; **R. M. Blackmore,** Phillips Petroleum Co., Billings; and **William Strickland,** Skelly Oil Co., Bismarck.

O. H. Eichelberger, district superintendent of the South Central Texas division of Pan American Production Co., has been appointed division superintendent of Pan American Gas Co. **Charles E. Sonntag, Jr.,** senior engineer of Pan American Gas Co., has been appointed division foreman of Pan American Gas with headquarters at Texas City.

Leonard A. Nelson, geologist with The California Co., has been transferred from Bismarck, N. D., to Grand Junction, Colo. Additional company moves include: **J. P. Brogan,** geologist,

PERSONALS

from Bismarck to Salt Lake City; **George A. Carlyle,** of Youngstown Ohio, to Bismarck in a geological capacity; and **Lester A. Knight,** geophysicist, from Casper, Wyo., to Bismarck.

A. Lloyd Flood has been appointed district geologist at Regina, Sask., by Lion Oil Co. Flood, a native of Saskatoon, had been serving with Canadian Superior Oil of California, Ltd., in the subsurface department.

W. C. Miley, former district geologist at Houston for Houston Oil Co. of Texas, has been transferred to Casper, Wyo., as Rocky Mountain district geologist. He succeeds **R. P. Swirczynski,** who resigned to open consulting offices in Casper.

J. G. McMillan has resigned as petroleum engineer in the West Texas division of Union Oil Co. of California to join Murphy H. Baxter, independent operator at Midland, Tex., as chief engineer.

J. H. Means has been named production manager for light hydrocarbon and polyhydric chemicals by Dow Chemical Co. at its Freeport, Tex., plant. Dow also promoted three men to general superintendents. They are **A. C. Burkholder,** light hydrocarbon chemicals; **R. H. Smith,** polyhydric chemicals; and **T. E. Brown,** carbon tetrachloride and methyl chloride. Several other promotions in addition to Burkholder's were made in the light hydrocarbon chemicals department. They include: **D. C. Donaldson,** from superintendent of light hydrocarbon plants 1 and 2 to light hydrocarbon section superintendent; **E. H. Ivey,** from assistant light hydrocarbons superintendent in charge of butadiene operations to Donaldson's former job; **W. N. Milks** from planning engineer to superintendent of light hydrocarbon-3 and butadiene; **D. A. Rikard** from assistant superintendent to superintendent of light hydrocarbon-4; **G. H. Watkins** from assistant superintendent of light hydrocarbon-3 to superintendent of polyethylene; **J. L. Boyett** from research and development engineer to assistant superintendent of light hydrocarbon-1; **N. McNair** from research and development engineer to assistant superintendent of light hydrocarbon-2; **R. P. Metcalfe** from research and development engineer to assistant superintendent of light hydrocarbon-3; and **A. J. Seidule** from chemist to polyethylene laboratory supervisor.

First Petroleum Engineer Is Honored

Frederick A. Johnson of Oil City, Pa., right, the first man in history to receive the degree of petroleum engineer, is shown being honored by his alma mater, the University of Pittsburgh. H. G. Botset, head of the petroleum engineering department of Pitt, presents a memorial certificate to Johnson, who received his degree in 1915. Presentation was made at the annual meeting of the Pennsylvania Grade Crude Oil Association. Johnson recalled it was difficult to get a job in the early days of the profession. Hard-headed oil operators weren't easily convinced a petroleum engineer could become a useful asset. The young graduates usually went abroad with "intrepid wildcatters" or went into business for themselves, he said.

J. T. PONDER

James Taylor Ponder has been elected executive vice president of Kin-Ark Oil Co. Ponder is a member of the Secondary Recovery Association. Before the incorporation of Kin-Ark early this year, he served for 7 years as general manager of the independent oil operations in Arkansas and Louisiana of **Curtis A. Kinard,** now president of Kin-Ark.

Ernest H. Babitzke, former petroleum engineer with The Texas Co. at Notrees, Tex., has been promoted to reservoir engineer and transferred to Midland, Tex.

John E. Huff, Jr., independent Houston oil producer since 1947, has been named general manager of Talon Petroleum, C.A. He will direct development and production activities for the firm in Venezuela.

E. H. Cummins, former senior inspector of construction for Shell Pipeline Co., at Maracaibo, Venezuela, has been named to a similar position with Butte Pipe Line Co. at Glendive, Mont. Butte is owned by Shell Oil Co., Murphy Corp., and Northern Pacific Railway Co. The firm plans a crude-oil line from eastern Montana to Guernsey, Wyo.

John H. Emerson, III, has joined Seaboard Oil Co. at Sweetwater, Tex., as a production engineer.

J. R. Sanders has been promoted to assistant regional geologist in Continental Oil Co.'s Rocky Mountain office at Denver.

C. B. Heartwell has been appointed superintendent of the gas and natural-gasoline division of Standard Oil Co. of California's southern district producing department. He succeeds **G. C. McLaren,** who has retired after more than 38 years with the company.

Carle S. Boyer, exploration geologist for The Texas Co., has been promoted to district geologist at Sterling, Colo. He succeeds **E. S. Banta,** who was transferred to Casper, Wyo., as district geologist.

James W. Carneal, formerly assistant superintendent of Texas Gas Transmission Corp.'s pipeline department, has been appointed industrial representative for the sales and customer relations department.

PERSONALS

William E. Davis, Jr., Houston, has joined Gulf Coast Leaseholds, Inc., as executive vice president.

Paul E. Riley, geologist with George E. Cameron, Jr., has been transferred from Denver to Ardmore, Okla.

William G. Pulliam, patent counsel of Cities Service Research & Development Co., has been elected vice president.

Fred M. Springer, former field gager with Magnolia Pipe Line Co. at Wichita Falls, Tex., has been promoted to mechanical engineer and transferred to Dallas.

Bob Grinnell, geologist, and **Arnold Romberg,** seismologist, have been transferred from the Bismarck, N. D., office of Mobil Producing Co. to Casper, Wyo.

Clarence L. Moody, retired geologist of Ohio Oil Co., has opened consulting offices in Houston. Moody served with Ohio for 35 years before retiring.

D. M. West, formerly district geologist for Socony-Vacuum Oil Co. of Canada, Ltd., in Edmonton, has been transferred to Calgary to perform staff geological functions.

R. F. Stimmel, geologist with Texas Petroleum Co. in Peru, has been transferred to the Colombian division of this Texaco subsidiary. Additional Texpet transfers include **J. A. Short,** petroleum engineer, from New York to the Colombian division, and **Robert Ottiker,** senior aviation mechanic, from Venezuela to the Peruvian division.

H. B. Britton, vice president of Trans-Arabian Pipe Line Co., has been elected executive vice president. Formerly with Shell Pipe Line Co., Plantation Pipe Line Co., and Middle East Pipelines, Ltd., Britton began affiliation with Tapline in 1947 as a consultant and joined the company 4 years later. He will headquarter in Beirut, Lebanon.

Joe B. Gossett, former chief gager in the North Texas district of Sinclair Pipe Line Co., has been transferred to a similar position in the Southeast Texas division at Silsbee. **Sherman (Johnny) Davis,** former chief gager for Sinclair in South Texas, was transferred to North Texas to succeed Gossett. **William Thompson** was named chief gager in the South Texas district to succeed Davis.

H. Carroll Talley, Jr., staff geophysicist in Sohio Petroleum Co.'s exploration headquarters in Oklahoma City, has succeeded **John Bemrose** as assistant to chief geophysicist **Roy Bennett.** Replacing Talley in the Oklahoma district is **Cyril B. Smith.**

Willard D. Maxwell, Carter Oil Co., has been promoted from district superintendent at Great Bend, Kans., to production staff assistant for the southern division in Shreveport, La. **Hugh H. Goerner,** assistant district superintendent at Magnolia, Ark., will succeed Maxwell at Great Bend.

C. U. Daniels, president and managing director since 1951 of Royalite Oil Co., Ltd., Calgary, has been appointed

C. U. DANIELS

RAY ALTHOUSE

chairman of the board, and **Ray Althouse,** executive vice president since 1952, has succeeded him to the presidency. Daniels will continue as Royalite's chief advisory officer. Althouse will assume direction of the company's varied operations, which extend over four Canadian provinces and into many areas of the United States.

C. E. Christie and **E. N. Little,** district superintendents in Sinclair Pipe Line Co.'s Texas crude-oil pipeline division, have exchanged jobs. Christie takes Little's position at Corpus Christi, and Little replaces Christie in Houston.

R. C. Rice has been promoted to senior engineer in the operations division of Sohio Pipe Line Co., Cleveland. **K. A. Stierman** has been promoted to senior engineer in the engineering division, and **K. E. Lundquist** has been elevated to senior engineer in the administrative division. **A. A. Dorffi** has been appointed staff assistant to **C. E. Curry,** general superintendent of the transportation department. Dorffi will reside in St. Louis, where he will head a newly created operations staff.

R. A. Eeds has been elected vice president in charge of industrial relations for Arabian American Oil Co. Eeds, who had been general manager of operations, joined Aramco in 1950. He will continue to be located at the company's headquarters in Dhahran, Saudi Arabia.

John R. Suman, former vice president and director of Standard Oil Co. (N. J.), has been elected to the advisory committee of the board of directors of the Chemical Corn Exchange Bank, New York. Suman, who established a consulting business in Houston after his recent retirement, will also serve as special consultant to the oil and gas department of the bank.

J. F. Redmond, Shell Oil Co. division production manager in Oklahoma City, has been transferred to the company's head office in New York as manager of exploitation engineering. **O. L. Nuernberger,** division production superintendent in Oklahoma City, has assumed the duties of acting division production manager.

Justin Zinn, professor of geology at Michigan State College, East Lansing, was recently elected president of the Michigan Geological Society. Other new officers are: **Claude W. Hibbard,** Michigan University, Ann Arbor, vice president; **F. Wells Terwilliger,** Michigan Department of Conservation, Lansing, secretary-treasurer; and **B. T. Sandefur,** Michigan State College, business manager.

J. W. Hopkinson, president of Penn-Petroleum Corp., Detroit, was named president of the American Society of Lubrication Engineers at the annual meeting of the group. Other newly elected officers are: **W. Deutsch,** Trabon Corp., Cleveland, vice president at large; **E. R. Booser,** General Electric Co., West Lynn, Mass., secretary; and **W. H. Fowler, Jr.,** Pure Oil Co., Chicago, treasurer.

Gavin Witherspoon of New York has been appointed vice president and general manager of American Independent Oil Co. He will reside in Kuwait. Formerly vice president of Bahrain Petroleum Co., Witherspoon will replace **James MacPherson,** who is retiring after 6 years of service as Aminoil's vice president and general manager in Kuwait.

PERSONALS

MacPherson will assume new duties as petroleum adviser to the Saudi Arabian Government.

Fred H. Carr, British-American Oil Producing Co., has been promoted from district geologist at Casper, Wyo., to di-

F. H. CARR

T. W. BIBB

vision geologist at the company's Rocky Mountain division exploration office in Denver. **Thomas W. Bibb,** formerly senior geologist at Ardmore, Okla., has replaced Carr in Casper.

John H. Wimberly, executive vice president of Houston Natural Gas Corp. since 1947, has been elected president, succeeding **Frank C. Smith** who was named board chairman.

K. Stewart Cronin has been appointed exploration manager of Pure Oil Co. effective July 1. He will succeed **Donald M. Davis,** who will become assistant manager of Pure's Gulf Coast producing division in Houston. Cronin has been with Pure 21 years.

Harvey D. Borger, Creole Petroleum Corp., has been appointed acting western division geologist at Maracaibo, Venezuela, to replace **Claude G. Holcomb,** who becomes acting manager of the geological department in Caracas. Other Creole appointments in Venezuela include: **Woodrow Huddleston,** as assistant superintendent of the San Joaquin district, eastern division, to replace **Duane Davis,** who was transferred to the Amuay refinery on the Paraguana Peninsula as coordinator; **Frank Walker Johnson,** as acting manager of the geological department in Caracas, to replace **W. E. Franks,** who was named acting eastern division manager; **Robert Mays,** as acting assistant manager of the western division, Maracaibo; **Frederick H. Warner,** as acting administrative assistant in the production department, Caracas, to replace **William C. Merritt,** who was appointed assistant superintendent of La Salina district, western division; and **Wendell J. Pfeffer,** as acting supervisor of the geophysics section, geological department, Caracas.

Raymond V. Cruce, former chief of the reserves group in the Houston division of Gulf Oil Corp., has resigned to join Robert W. Harrison & Co., Houston consulting firm.

Albert H. Wehe has joined The Texas Co. at Port Arthur, Tex., as a chemical engineer.

R. A. Cruickshank, director and general manager of Canadian Devonian Petroleums, Ltd., has been appointed vice chairman of the board of directors of the Canadian Petroleum Association.

H. C. Kauffman, Jr., has been appointed production manager for Carter Oil Co.'s southern division in Shreveport. Kauffman was production staff assistant in Shreveport prior to this appointment.

Percy Walter Geldard was elected president of the Canadian Gas Association at the group's annual meeting at Niagara Falls, Ont. Geldard is operating head of the distribution division of Consumers' Gas Co., Toronto.

C. T. Jones, independent oil operator of Tulsa, has been appointed consultant for Aero Service Corp., Philadelphia. Jones was manager of Stanolind Oil & Gas Co.'s exploration activities for 3 years before establishing his own independent practice.

W. P. Z. German, Jr., Midland, Tex., attorney, has joined Revilo Royalty Co., Dallas. His duties will involve lease operations and the acquisition of properties, as well as company legal matters. German was at one time with Skelly Oil Co. in Tulsa.

Clarence G. Matthews, drilling and production superintendent for New Superior Oils of Canada, Ltd., has joined General Petroleums of Canada, Ltd., as a drilling engineer.

Charles H. Dresbach, former manager in Tunisia of the Gulf subsidiary, Societe Nord Africaine des Petroles, is now located at Accra, Gold Coast, as West African representative for Eastern Gulf Oil Co., Ltd.

Ralph N. Thomas, geologist and engineer for Inland Gas Corp., Ashland, Ky., has joined the measurement and research staff of Texas Gas Transmission Corp. at Owensboro, Ky., as geologist for underground storage.

Wilhelm Tempelaar Lietz, petroleum engineer in Los Angeles for Shell Oil Co., has been made a knight of the Order of Oranje Nassau by authorization of Queen Juliana of the Netherlands. Tempelaar Lietz is president of the Netherlands American Society of Southern California.

J. W. Goddard has been transferred by Sunray Mid-Continent Oil Co. from Midland, Tex., where he was manager of exploration and Midland district landman, to Roswell, N. M., where he will direct exploration and land activities in the Roswell, Albuquerque, and Salt Lake City areas. **Allen J. Watts,** on special assignment for the company since the recent merger, will replace Goddard at Midland.

DEATHS

James E. Pew, 54, member of the board of directors and manager of the natural-gas and natural-gasoline division of Sun Oil Co., died June 19 at his home in Malvern, Pa. During World War II Pew was director of the natural-gas and natural-gasoline division of the Petroleum Administration for War. He joined Sun Oil in 1946 to establish the division which he subsequently headed.

James B. Kirk, 61, independent oil operator in Texas, died recently in a Dallas hospital.

Edward W. Johnson, 44, manager of process pump sales for the Oil Well Supply Division of United States Steel Corp., died June 20 in Dallas. Prior to joining the company in 1950, he was employed as a mechanical engineer at Gulf Oil Corp.'s Port Arthur, Tex., refinery, and as chief mechanical engineer at The Texas Co.'s Port Arthur plant.

Oscar A. Reed, 67, died recently in a Springfield, Ill., hospital. Reed had been an independent oil operator for 35 years and had lived in Springfield for the last 15 years.

Tom McElheny, 47, formerly superintendent for B. & J. Service, an oil-well cementing company in Los Angeles, died of a heart attack June 17 at Long Beach, Calif.

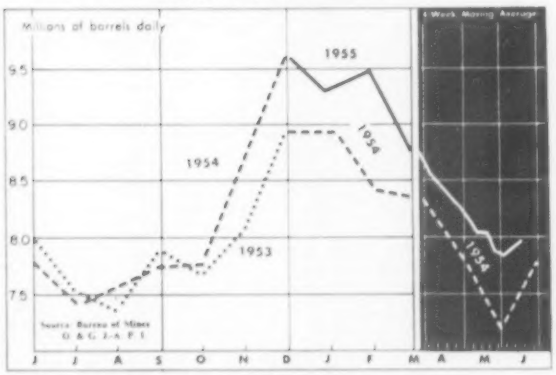
W. E. Cowan, 46, Chicago Corp., head of the land department at the firm's Fort Worth operating headquarters, died June 20 in Fort Worth.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,621,375	UP	26,900	UP	108,180
Crude stocks	276,692,000	DOWN	1,544,000	UP	507,000
Completions	1,169	UP	160	UP	182
Refinery runs	7,520,000	DOWN	2,000	UP	627,000
Gasoline stocks	165,285,000	DOWN	948,000	DOWN	3,698,000
Distillate stocks	91,269,000	UP	2,855,000	UP	11,867,000
Residual stocks	45,684,000	UP	490,000	DOWN	4,088,000
Four-product stocks	330,673,000	UP	3,800,000	UP	6,574,000
Total imports	1,201,500	UP	124,000	UP	227,500

TOTAL DEMAND—ALL OILS



Crude Production This Year Has Been Inflated by Crude Stock Gains

CRUDE production for the first 5 months of the year averaged almost 6,800,000 bbl. daily for a gain of 5.5 per cent over the same months of 1954. But, this increase should not be used as a base for projecting production for the remaining months of the year.

The volumetric gain over last year was about 358,000 bbl. daily, but a major factor in this increase was the amount that went to storage. Stocks of crude had dropped to 258,000,000 bbl. by the first of this year. Since the normal inventory level ranges between 275,000,000 and 280,000,000 bbl., stock additions were expected during the early months of the year. By the end of May, crude stocks had climbed to 280,000,000 bbl. or about the top of the normal range. This meant that 145,000 bbl. daily or about 40 per cent of the total crude-production increase went into storage tanks to replace oil withdrawn during the last 5 months of last year. About 22,000,000 bbl. of the total January-May production should have been produced in the last 2 quarters of 1954.

Cuts in production allowables in May, particularly in Texas, resulted in a drop of about 150,000 bbl. daily for crude production. This reduction slowed down the additions to crude inventories but the peak stock level was not reached until about the end of the month.

The most important factor in the reversal of the crude stock trend was the big gain in refinery runs, starting with the third week of May. Runs for the first 2 weeks of May averaged 7,045,000 bbl. daily. For the 2-week period ended June 10, runs had climbed to 7,543,000 bbl. daily for a gain of almost 500,000 bbl. daily over the first 2 weeks of May.

If runs continue at this high level, crude inventories will drop rapidly, but product stocks will climb at a rate that will tend to put pressure on product markets. Stocks of the four major products gained almost 16,000,000 bbl. in the 4 weeks from May 13 to June 10. This is about 2,000,000 bbl. more than for the same weeks last year, and it was the abnormal stock increases in the early summer of 1954 that produced the break in product prices.

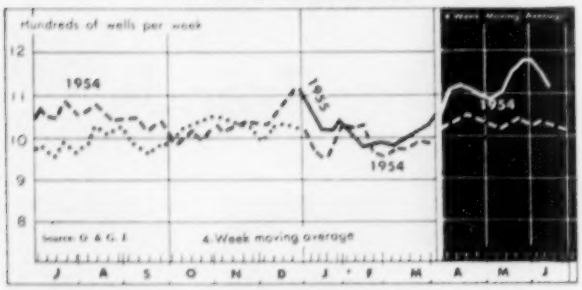
Total demand for crude and products in the first 5 months of this year was up about 7.4 per cent over the same period in 1954. Demand for domestic crude gained slightly less than 4 per cent in contrast with the 5.5 per cent increase in crude production. The difference represents larger additions to crude inventories.

Crude imports gained about 14 per cent for the first 5 months, and product imports increased almost 26 per cent.

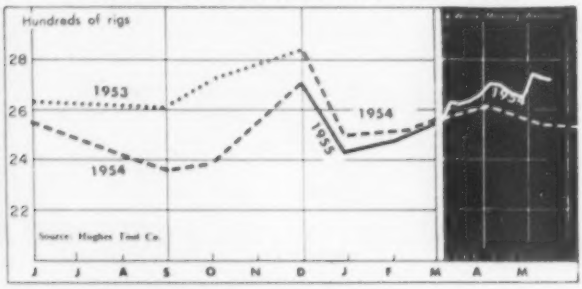
Since there is no need for further additions to crude inventories, total crude supply for the remainder of the year should be tailored to meet expected demand.

Refinery operations continued at the same high level for week ended June 17. Runs were 627,000 bbl. daily above the average for same week last year. Kerosine stocks went up more than gasoline stocks dropped. Middle-distillate stocks are 14,000,000 bbl. higher than last year.

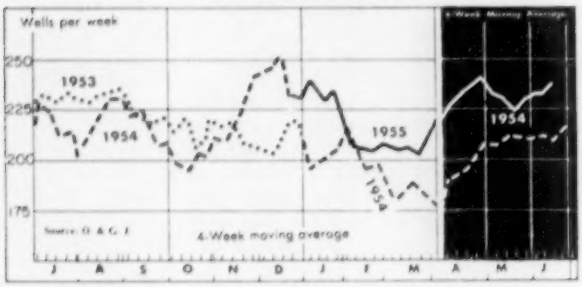
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	6-20-55	Change from 6-13-55	Change from 6-21-54
Gulf Coast	580	—14	25
N. and W. Texas-New Mexico	895	3	79
Arkansas-N. Louisiana-E. Texas	188	8	16
Oklahoma	341	—6	31
Kansas-S. Nebraska	171	—15	6
Illinois-Eastern	148	13	1
Rocky Mountain	251	—4	—9
Pacific Coast	150		13
Total United States	2,724	—15	162
Western Canada	184	17	78

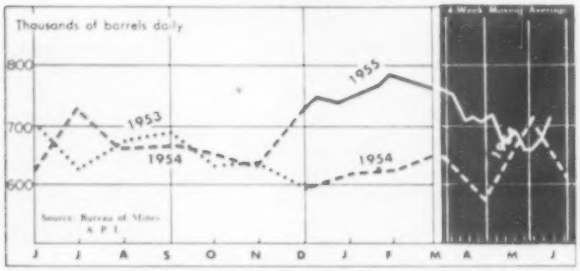
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 18, 1955

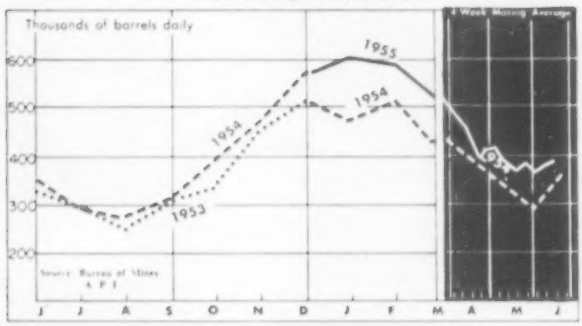
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	0	0	0	0	0	40	50	0	0	0	0	0	0	0	0	38	38
Arkansas	14	8	0	6	50,939	332	263	0	0	0	3	3	16	0	1	81	98
California	52	45	0	7	218,561	1,204	1,153	0	0	0	5	5	19	0	5	184	208
Colorado	35	9	3	23	184,116	637	601	0	0	1	14	15	22	0	15	318	355
Illinois	131	75	0	56	326,204	1,682	1,274	1	0	0	10	11	28	0	1	248	277
Indiana	18	7	1	10	18,244	349	375	0	0	0	4	4	8	0	0	156	164
Kansas	95	42	12	41	354,314	2,353	2,012	3	0	1	17	21	64	1	18	372	455
Kentucky	34	13	6	15	53,736	577	520	2	0	0	5	7	21	0	5	90	116
Louisiana	75	44	4	27	450,955	1,839	1,500	2	2	1	9	14	57	40	13	182	292
North	42	26	2	14	145,111	993	803	1	0	0	4	5	10	3	1	73	87
South	33	18	2	*13	305,844	846	697	1	2	1	5	9	47	37	12	109	205
Michigan	11	3	0	8	37,434	242	256	0	0	0	3	3	6	0	0	93	99
Mississippi	9	3	0	6	62,997	222	173	1	0	0	4	5	6	0	0	82	88
Montana	3	3	0	0	10,270	146	127	0	0	0	0	0	3	0	1	41	45
Nebraska	15	5	0	10	85,761	323	164	0	0	0	7	7	17	0	0	127	144
New Mexico	40	26	11	3	191,112	689	490	1	0	1	5	7	17	1	6	53	77
Northwest	11	0	11	0	49,722	197	143	0	0	1	3	4	2	0	6	19	27
Southeast	29	26	0	3	141,390	492	347	1	0	0	2	3	15	1	0	34	50
North Dakota	8	5	0	3	53,894	103	111	0	0	0	3	3	0	0	0	18	18
Ohio	16	10	1	5	30,383	500	529	0	0	0	0	0	1	0	4	13	18
Oklahoma	156	105	3	†48	518,718	3,949	4,269	6	0	1	14	21	62	7	17	300	386
Pennsylvania-New York	29	12	4	‡13	52,106	775	1,129	0	0	0	0	0	0	0	5	5	10
Texas	399	229	12	158	1,787,576	9,094	8,343	14	0	6	92	112	345	51	66	1,868	2,330
Southwest (1 & 4)	54	29	1	24	190,383	1,423	1,175	2	0	0	20	22	44	15	21	362	442
Gulf Coast (2 & 3)	56	25	5	26	312,838	1,195	1,206	2	0	2	11	15	39	28	23	296	386
East (5 & 6)	23	8	3	12	106,439	441	438	0	0	1	10	11	13	3	3	141	160
North Central (7-B & 9)	146	82	2	62	523,507	3,278	3,167	8	0	2	24	34	178	0	6	707	891
West (7-C & 8)	110	77	0	33	617,845	2,303	1,920	2	0	0	27	29	68	1	6	350	425
Panhandle (10)	10	8	1	1	36,564	454	437	0	0	1	0	1	3	4	7	12	26
Utah	0	0	0	0	0	31	28	0	0	0	0	0	3	0	2	18	23
West Virginia	17	0	12	5	43,110	281	245	0	0	1	0	1	0	0	7	10	17
Wyoming	11	7	0	4	49,496	355	639	2	0	0	3	5	11	0	3	72	86
Miscellaneous (Nev.)	1	0	0	1	8,300	16	79	0	0	0	0	0	0	0	0	12	12
Total United States	**1,169**	651	69	449	4,588,226	25,739	24,330	32	2	12	198	**244**	706	100	169	4,381	5,356
Total previous week	1,009	551	68	390	4,129,470			32	3	5	185	225	674	98	157	4,183	5,112
Total June 19, 1954	987	528	73	386	3,931,685			25	6	11	199	241	656	72	163	4,045	4,936
Western Canada	60	44	0	16	233,802												

Service wells included: *1, 16, ‡7.

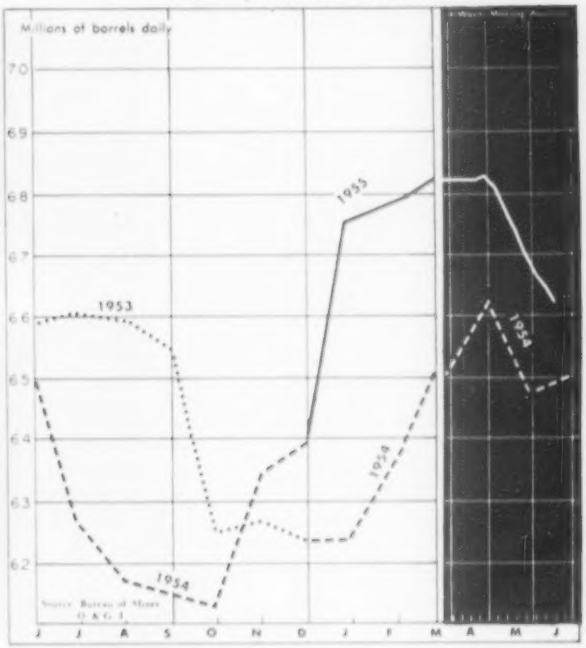
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE OIL PRODUCTION

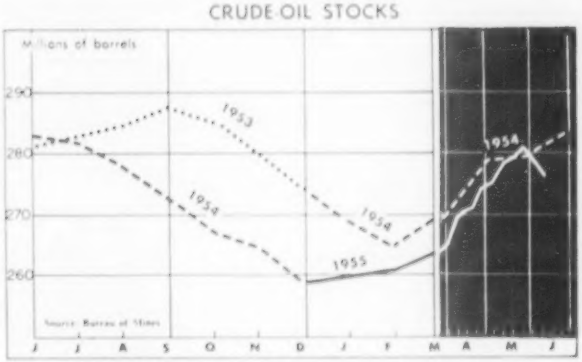


DAILY AVERAGE PRODUCTION FOR WEEK

	June 18 Crude oil	June 18 Lease condensate	June 18 Total	June 11 total
Alabama	3,700		3,700	3,500
Arkansas	73,550	450	74,000	73,400
California	977,400		977,400	975,200
Colorado	140,900		140,900	138,300
Eastern	46,500		46,500	46,500
Florida	1,300		1,300	1,300
Illinois	228,100		228,100	234,100
Indiana	29,500		29,500	29,400
Kansas	318,000		318,000	308,500
Kentucky	40,200		40,200	40,400
Louisiana	640,700	47,700	688,400	688,700
North	112,700	2,700	115,400	115,700
South	528,000	45,000	573,000	573,000
Michigan	30,800		30,800	32,300
Mississippi	94,150	4,150	98,300	98,300
Montana	44,900		44,900	46,100
Nebraska	29,700		29,700	29,200
New Mexico	222,000	3,550	225,550	225,350
North Dakota	20,600		20,600	20,800
Oklahoma	554,400		554,400	532,600
Texas	2,733,200	47,325	2,780,525	2,780,525
Dist. 1	53,000	550	53,550	53,550
Dist. 2	136,700	7,500	144,200	144,200
Dist. 3	421,000	21,500	442,500	442,500
Dist. 4	230,800	5,200	236,000	236,000
Dist. 5	45,500	400	45,900	45,900
Dist. 6	115,800	4,800	120,600	120,600
East Texas field	207,300		207,300	207,300
Dist. 7-B	141,000	50	141,050	141,050
Dist. 7-C	183,000	4,600	187,600	187,600
Dist. 8	906,000	2,100	908,100	908,100
Dist. 9	204,600	500	205,100	205,100
Dist. 10	88,500	125	88,625	88,625
Utah	5,700		5,700	5,500
Wyoming	282,700		282,700	284,100
Others	‡200		‡200	400
Total U. S.	6,518,200	103,175	**6,621,375**	6,594,475
Change from previous week, up			**26,900**	
Canada	†370,175		†370,175	†286,927
Total U. S. production January 1-June 18			1,137,837,700 bbl.	
Same period last year (crude plus cond.)			*1,090,042,755 bbl.	

*Includes 17,380,925 bbl. condensate. †Week ended previous Monday. ‡S.D. 100, Nev. 100.

CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

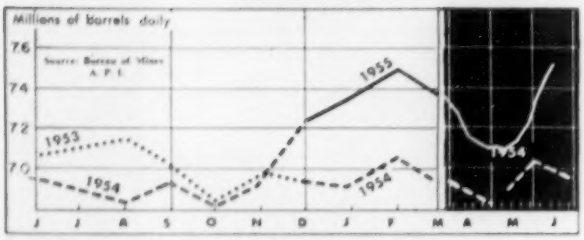
(Thousands of barrels daily)

	June 11, '55	June 4, '55	June 12, '54
Pennsylvania Grade	2,840	2,896	3,190
Other Appalachian	1,960	2,030	1,925
Illinois, Indiana, Michigan	11,954	12,156	12,891
Nebraska, North Dakota	2,185	2,405	(‡)
Kansas	8,505	8,467	9,878
Oklahoma	24,354	24,364	27,059
Arkansas	2,849	2,904	3,381
Louisiana	16,075	17,034	16,163
North	2,692	2,671	2,520
South	13,383	14,363	13,643
Mississippi	2,928	2,893	3,211
New Mexico	8,379	8,340	7,203
Texas	129,702	129,232	128,206
East Texas proper	10,242	10,094	12,294
West Texas	58,025	57,212	54,424
Texas Gulf	26,303	26,473	28,660
Other Texas	35,132	35,453	32,828
Wyoming	15,546	15,426	13,289
Other Rocky Mountain	5,216	5,113	4,282
California	31,352	31,317	32,881
Foreign	†12,847	13,659	12,626
Total	276,692	278,236	276,185

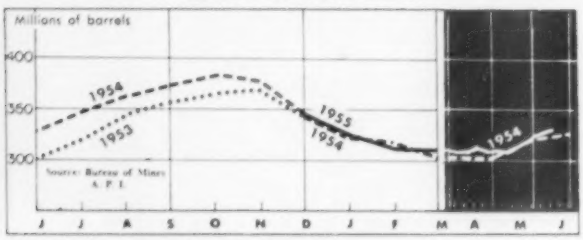
*Bureau of Mines. †Includes 2,955,000 bbl. in California. ‡Included with Kansas.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

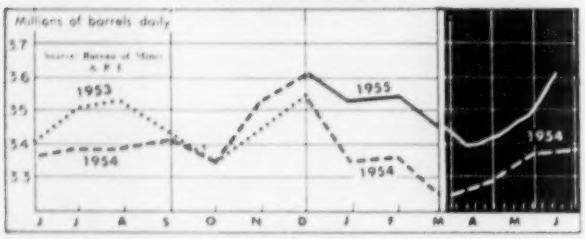
REFINERY RUNS



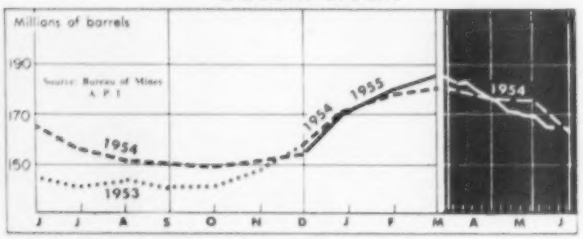
FOUR-PRODUCT STOCKS



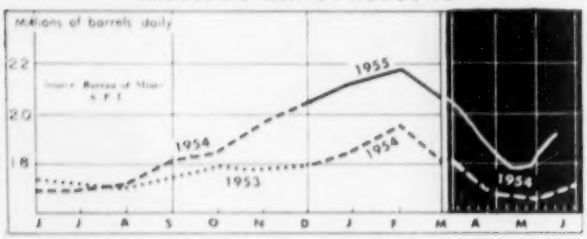
GASOLINE PRODUCTION



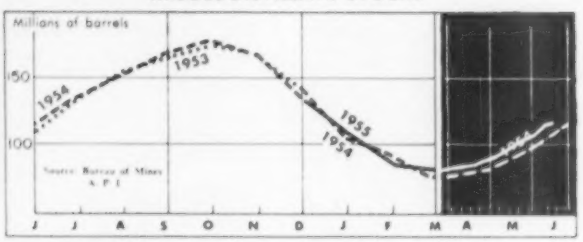
GASOLINE STOCKS



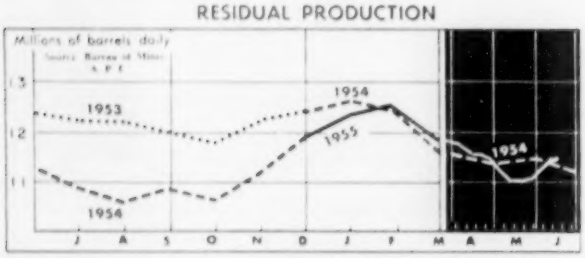
MIDDLE-DISTILLATE PRODUCTION



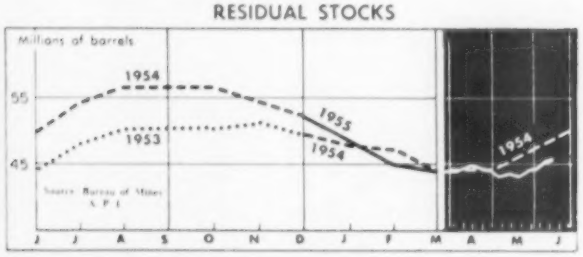
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



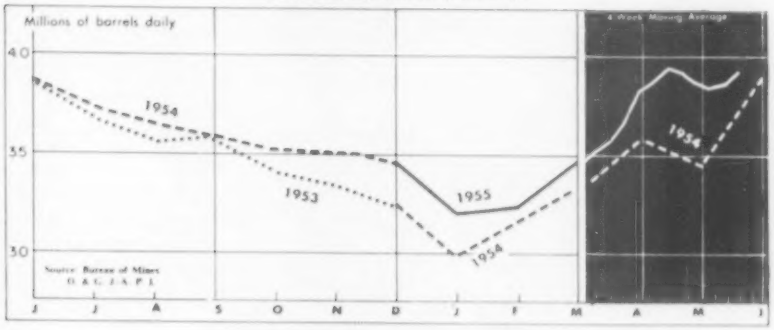
A.P.I. REFINERY REPORT, JUNE 17

(Thousands of barrels)

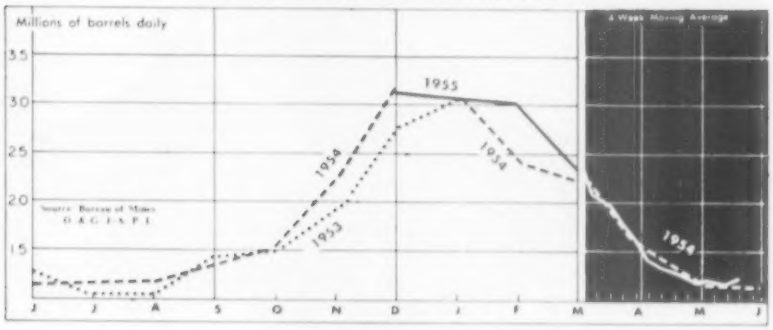
District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June 1954—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,047	392.9	28.1	245.7	179.6	36,955	11,627	29,574	9,766	1,031	429.3	31.4	230.1	187.5
Appalachian:														
District 1	91	31.4	2.6	19.3	4.7	4,254	487	1,887	310	108	47.2	3.5	23.9	8.5
District 2	100	47.4	5.7	15.0	11.0	2,310	407	662	268	93	52.8	3.5	10.2	10.7
Ind., Ill., Ky.	1,363	725.3	57.7	251.4	177.6	34,445	6,542	17,412	4,394	1,273	675.1	67.4	234.2	154.4
Okla., Kans., Mo.	720	409.2	23.9	161.4	43.7	15,577	1,674	10,405	888	615	350.6	19.7	132.4	43.8
Inland Texas	262	203.4	8.1	60.7	31.4	6,484	415	1,711	1,322	243	173.4	8.6	44.2	23.7
Texas Gulf Coast	1,836	869.0	104.6	428.9	257.0	22,745	3,482	10,601	4,707	1,630	779.9	103.5	357.5	220.2
La. Gulf Coast	699	345.1	63.0	180.7	37.3	9,836	2,253	5,386	1,269	565	268.1	51.3	143.0	46.4
N. La. and Ark.	88	34.9	6.6	22.3	5.7	3,830	957	1,794	56	89	36.0	7.4	19.7	6.5
Rocky Mountain:														
New Mexico	20	11.6	1.0	2.9	2.7	237	4	97	28	20	11.7	0.2	3.7	2.6
Other Rocky Mtn.	273	123.4	4.3	64.0	38.3	7,216	251	2,184	835	256	126.6	3.8	56.1	36.6
California	1,021	454.3	8.3	148.4	369.4	21,396	336	9,556	21,841	1,024	428.6	5.6	143.9	382.1
June 17, 1955	7,520	3,647.9	313.9	1,600.7	1,158.4	165,285	28,435	91,269	45,684	6,947	3,379.3	305.9	1,398.9	1,123.0
June 10, 1955	7,522	3,712.1	225.6	1,679.3	1,136.6	166,233	27,032	88,414	45,194					
June 18, 1954	6,893	3,369.6	312.3	1,327.4	1,152.9	168,983	25,942	79,402	49,772					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

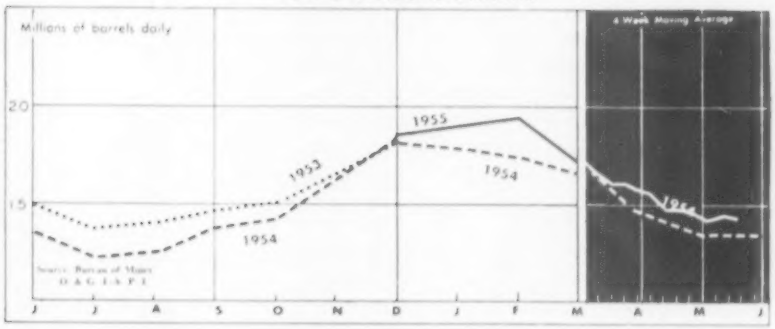
TOTAL GASOLINE DEMAND



TOTAL MIDDLE DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of June 22, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11.25	11.25-12	10.25-10.75
Premium gasoline	12-12.5	13-13.75	11.50-12
42-44 w.w. kerosine	9.25-9.625	10.05	8.5-8.75
No. 2 straw fuel oil	8.375-8.75	9.3	8.0-8.25
No. 6 residual	$1.75-1.80	$2.35-2.45	$2.00-2.05

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.5	4.0	4.25
Grade 18-55	5.4	4.9	5.15

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Gasoline price wars continue at stations in areas of the upper East Coast with additional weakness reported for parts of New England. Demand for distillate fuels is very little above last year. Summer-fill sales of heating oil are below last year. Group 3 spot price for No. 2 fuel has dropped 0.375 cent since middle of May but is above last year.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 6-17-55	3,613	3,918
March 1955	3,460	3,408
May 1954	3,377	3,463
June 1954	3,379	3,894
Middle distillate:		
Four weeks ended 6-17-55	1,917	1,233
March 1955	2,060	2,297
May 1954	1,674	1,167
June 1954	1,705	1,151
Residual fuel:		
Four weeks ended 6-17-55	1,144	1,422
March 1955	1,185	1,749
May 1954	1,148	1,342
June 1954	1,123	1,339

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, January 21, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.50
Middle District	3.37
Southwest Pennsylvania	3.08
West Virginia	2.97
Buckeye Grade	2.91
Zanesville Grade	2.72
Illinois Basin	2.90

"7,125 men and women signed up to join those already saving for their financial security..."

GEORGE H. COPPERS

President,
National Biscuit Company

"There is no greater honor than partnership in an enterprise as important to a nation as the Payroll Savings Plan for United States Savings Bonds. We view our recent person-to-person canvass of employees in behalf of Bonds as practical patriotism. It supports our Government's efforts to stabilize the value of the dollar. The campaign also benefited our employees. 7,125 men and women signed up to join those already saving for their financial security in this easy, automatic way."

The Payroll Savings Plan is the backbone of Series E Bond Sales. 8,500,000 employees in more than 45,000 companies invest more than $160,000,000 in Savings Bonds *every* month.

The person-to-person canvass is the keystone of The Payroll Savings Plan. In company after company person-to-person canvasses *conducted* by *employees* have increased participation to 60%, 70%—even 90% plus.

Why don't *you* conduct a person-to-person canvass in *your* company? Here are two, simple steps:

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TULSA 1, OKLAHOMA

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FOR SALE: 1—Worthington Type HB Packaged Compressor Unit, single stage, 7" x 13" H-844 motor. Belt driven, equipped with 250# WP intake scrubber, Wahlberg-McCreary gas starting equipment and automatic controls. Delivery 1,600 MCFD at 100# intake, 350# discharge. Plant used 1 year. Box H-865, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

900 HP ALCO ENGINES

Mod. 6-12-½- x 13, 700 RPM Supercharged, Hydr. Coupling #3497-8, 3500, Very Low Price.

Excellent Condition—War Surplus

S. M. DAVIS

510 LaSalle, St. Louis

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Luxury

Speed

Long Distance

A fine twin engine executive plane that exceeds the speed and range of the most modern twin engine airliners is now available at a small fraction of their cost. This is a well equipped ten passenger Ventura with reclining seats, sleeping couches and a very complete galley. It is for sale for immediate operation. Manufactured by Lockheed Aircraft Co.

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SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply, Tulsa.

FOR SALE: Water pressure plant and Oil Well Pumping Power Equipment, including Clark, Bessemer and Reid Gas Engines, some convertible to Oil. Worthington, Clark and National Transit pressure pumps. National and Reid Bandwheel Powers, etc. For complete information, write QUAKER STATE OIL REFINING CORP., Box 337, Bradford, Penna.

ATTENTION
OIL INDUSTRY
(Operators, Producers and Drillers)

FOR SALE
$100,000.00 Inventory Drilling Tools
At 35% Off
(All or Part)

REED CORE KINGS
Cutter Heads and Core Catchers
Sizes from 5⅞" to 8½" both Hard and Soft formations for K-500 to K-675 barrels complete with K-36A 2 piece Core Catcher.

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(For Wire Line Coring)
Sizes from 7⅞" to 9⅞", both Hard and Soft formations, both Pin and Box connecctions for all type barrels.

H. C. SMITH, SECURITY AND REED ROLLER ROCK BITS
Sizes from 5⅞" to 9⅝". Soft, Medium and Hard formations. Includes some Jet Bits.

All materials guaranteed factory new, manufactured 1952. No leasing agreement required. Write for detailed list and prices.

B. E. Cowan & Associates
Box 328 Elizabethtown, Kentucky

USED EQUIPMENT

#527—Franks Model 44-TM, Single Drum, Truck Mounted Servicing Unit, 8x10x50' Single Pole Mast, Mounted on FWD Truck.

#516—Franks Model E.T. Single Drum Servicing Unit, 8x10x62' Single Pole Mast, Mounted on 1941 KS-F International Truck.

#526—Franks Super East Texas Double Clutch, Single Drum, Mounted upon KS-11 International Truck. No Mast.

#541—Franks Model ET Single Drum with 8x10x62-ft. Mast, Mounted upon 1948 Model KS International Truck.

#517—Type 3 O.C.S. Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

#525—50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.

#533—Cardwell KL Double Drum Spudder with 60 ft. derrick.

Write, Wire or Call

FRANKS MFG. CORPORATION
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FOR SALE
NEW BUDA ENGINES

2—PC2505 $7,500.00 each
With Gas-Butane Equipment, Radiators, Starting Engines, less P.T.O.

6—K-428 $1325.00 each
With Radiators, Electric Starting, less Batteries.

Less than Manufacturers cost.
Engines guaranteed new, in warehouse.

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Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Detailed inventory available upon request.

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2D-4D-5D PUMPING UNITS
#303—#404 Core Barrels

BUY DIRECT FROM FACTORY AT WHOLESALE PRICES

#4D and #5D Units A.P.I. Approved

Write for literature & prices.

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FOR SALE: A Clean 1500' FAILING Model 44 Rotary Drill and Core Rig mounted on 4 wheel drive truck, complete with Dog House, Light Plant, and tools ready to work. Located in Eastern Illinois. Contact R. A. Landrey, Washington, Indiana. Phone 2395 W.

2—Cooper-Bessemer Gas Engine Generating Units,

complete with exciter, generating panel, and engine accessories.
1—300 KW, 450 hp. (reconnectable to 480-volt) 400-r.p.m. Type JSG-6.
1—200 KW, 300 hp. 327 r.p.m., Type JTB6. (This unit can be supplied at 400 r.p.m. with a 250 KW), 375 hp. 1—250 KW, 375 hp., 450 r.p.m. Type JSG-5. 1—450 KW, 675 hp., 450 r.p.m., Type JSG8.

MAX E. LANDRY, INC.,
P. O. Box 2238, Tulsa. Phone 7-1394

FOR SALE EQUIPMENT

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone 4-9700.

FOR SALE OR TRADE: Nearly new 2500 to 3000 ft. spudder, with tools, sheer poles and diesel motor, located in Oklahoma. Want spudder 1000 ft. capacity or large core drill, Failing preferred. Box 400, Great Bend, Kansas.

FOR SALE—At Oil Hill, Kansas, 4—Cooper Type 80 Twin Engine Compressor Units, with 8½"x20" Class A and 15½"x20" Class C Compressor Cylinders. Also 1—Type 80 Single DO, with 6½" and 10½" x 20" Tandem Cylinders. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

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CARDWELL S DRAWWORKS with WAK engine and air controls. 1948 model. Recently inspected and overhauled. All in excellent condition. Claypool Drilling Company, St. Elmo, Illinois.

FAILING MODEL 55, truck mounted complete with drill pipe, trucks and necessary tools, now drilling irrigation wells. Write or call E. J. Mickle, 203 S. Ellison, Guymon, Okla., pho. 520.

FOR SALE: 1—National 2½' x 13' 125# WP Low Pressure Vertical Separator and 1—Petco 1000# WP Porous Plastic Horizontal Separator, each complete with controls. Location Joaquin, Texas. Box H-866, The Oil and Gas Journal, Tulsa, Oklahoma.

LIQUIDATION
All New Equipment

Fairbanks-Morse Engine Model 38F90
7—Heavy Duty Trailers
7,423 ft. 2⅞ O.D. Drill Pipe
Gardner-Denver Pumps and Compressor

As well as all other equipment for Hydraulic Drilling Rig. Will entertain bids on individual items or on the entire lot.

For complete details,
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EXCELLENT USED GA-500 EMSCO RIG

LOW ENGINE HOURS ● REBUILT CANTILEVER MAST ●
7¾" x 16" PUMP ● STEEL MUD TANKS ●
GRADE "E" DRILL PIPE ● BLOWOUT EQUIPMENT ●
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Rig is completely equipped for medium-depth drilling and priced right. It is available for inspection and prompt delivery. Contact our closest Store or Office for complete details.

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5—600 HP IR Type KVG Gas Engine Driven 2 Stage Compressors (1942).

1—660 HP IR Type KVG Gas Engine Driven 2 Stage Compressor (1952).
$50,000 New Spare Parts for Above.

2—IR Starting Air Compressors, Model 25c, Type 40, 265#, 67.8 cfm.

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1—6' x 58' x ½" Shell Chrome-lined, 21 Trays, New 1951.
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1—3'6" x 49' x ⅞ "Shell, 28 Trays.
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4—3' x 50', 3' x 35', 3'6" x 28', Packed Towers.

TANKS - VESSELS

2—1250 Barrel Steel Welded Tanks.
2—1000 Barrel Steel Welded Tanks.
2—10' x 30' Steel Riveted Tanks.
10—8' x 15', 5'3" x 38'6", 7' x 15', 5' x 18' Vertical Vessels.

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7—Admiralty Tube, 500 - 1800 sq. ft.
2—Steel Tube, 800 sq. ft.

ATMOSPHERIC HEAT EXCHANGERS

8—715 sq. ft., 850 psig, 550° F., S.S.
6—470 sq. ft. 850 psig, 550° F., S.S.
13—715 sq. ft. 125 psig, 300° F. S.S.
6—715 sq. ft. Admiralty 125 psig, 300° F.

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10,000' of 8", 6", 4" and 2" steel pipe.
500 Ton of structural steel, steel plate, angles and channels.
500 steel gate and globe valves.

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LINER FOR 5½ casing 1300' new 4" OD seamless 6" couplings 8 round thread 85c. M. J. Regan, Coffeyville, Kansas.

CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

IDECO H30-S HYDRAIR, Single Drum Drawworks, air clutches, plain cathead. Excellent condition. $5,600. Write P. O. Box 2903, Beaumont, Texas.

MUST SACRIFICE one rotary rig, consisting of: Union Drawworks, with all air operated friction clutches. Three 145 h.p. Cummins Diesel engines, compounded. One 7¼"x14" Wheeling mud pump. One A-frame, doubles, reinforced mast and superstructure. One 17½" Oil Well turntable. One doghouse. One fuel tank. One water tank. One light plant. One water pump. Catwalk, pipe racks, and steps. Five drill collars. Contact M. Worthington, Box 606, Holdenville, Oklahoma, or phone 723.

FOR SALE—Wichita M Spudder with all tools. Will drill 2000 ft. Practically new motor. Burns Oil Company, Box 1098, Shawnee, Okla.

POWER DRILLING RIG complete with Wilson Super Draw Works and 6 x 12 Wilson Snyder Pump, each operated separately by 145 Horse Power GKU Waukesha Motors. All other equipment in first class condition. Rig is equipped with 80 ft. A Frame or Mast and 3500', 3½" OD, Range 2, Drill Pipe with API full hole tool joints. Rig will go 3300' easily. Call, wire or write: Louisiana Iron & Supply Company, Shreveport, Louisiana.

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We are open for any kind of deal.

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4½" O.D.—.188 wall—approx. 8½ lbs. D.R. Lengths—approx. 10,000 ft.
5⅝" O.D.—.188 wall—.219" wall—approx. 13 lbs. & 15 lbs. D.R. Lengths—approx. 20,000 ft.
10¾" O.D.—.203 wall—22.88 lb. double random lengths—approx. 20,000 ft.
26" O.D.—.188 wall 40' lengths—approx. 1000 ft.
30" O.D.—.344 wall—40' lengths—approx. 600 ft.

RECONDITIONED BLACK PIPE

8⅝" O.D.—.322 wall—28.55 lb.—16' to 20' Random Lengths—approx. 8500 ft.
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IMMEDIATE DELIVERY
SUBJECT TO PRIOR SALE

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BROWN-STRAUSS CORPORATION

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EQUIPMENT WANTED

WANTED 4000 to 5000 ft. power rig in good condition. Give location, description and price. Box H-850, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED core drill in good condition. 500 or 1,000 Mayhew preferred. Give price, location, and make, size and age of truck. Box H-848, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED good used triple Lee C. Moore derrick. Give location, condition and price. Box H-849, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED good 7¼x14 slush pump. Give location and price. Box H-851, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

JUNIOR ENGINEER to operate experimental profiling device for water flood injection wells. Unequaled opportunity to learn newest secondary recovery techniques and to participate in experimental work. Location Nowata, Oklahoma. Approximately one-half time traveling. Prefer graduate engineer with working knowledge of electrical circuits and some oil field experience. Write Sinclair Research Laboratories, Inc., P. O. Box 3006, Whittier Station, Tulsa, Oklahoma.

Chief Geologist

For independent integrated oil company. Must have 10 years experience. Houston location. Send detailed history, giving salary expected.

Box H-853, The Oil and Gas Journal, Tulsa, Oklahoma.

Mechanical Engineers

A medium sized leading manufacturer of oil field equipment and gray iron castings now needs additional engineers for product development and design work. Experience in similar or related work would be favored. All replies confidential. Write stating full qualifications and salary requirements to

BOX H-874,

THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

GEOLOGIST for employment in Denver office of aggressive independent oil company. Three years' experience in West Texas geology required. Salary commensurate with experience and qualifications. Send detailed personal history and work experience. Box H-876, The Oil and Gas Journal, Tulsa, Oklahoma.

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Graduate Petroleum Engineers with minimum 5 years' diversified production experience wanted by MAJOR OIL CO. with operations in Mid-Continent area from Gulf Coast to Canada. Salary commensurate with training and experience.

BOX H-856,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

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For responsible staff positions in New York Office directing the work of groups of experienced engineers doing process evaluation and design, economic studies and related work on refining and crude oil handling facilities, together with supporting power plants and other utilities. Chemical Engineering degree plus 10 years' process experience, preferably in petroleum, is desired.

Salary commensurate with training and work experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR, BOX 67

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MAGNOLIA PETROLEUM COMPANY has openings in the drilling section of the Petroleum Engineering Department for several experienced drilling engineers. This section specializes in engineering phases of drilling operations exclusively and is primarily concerned with our Company drilling equipment.

Applicants should desire to make a career in the drilling phase of the oil business.

Age range: 25-40.

Salaries commensurate with experience and level in organization.

Write with complete resumé of experience to:

D. V. CARTER,

Chief Petroleum Engineer,

MAGNOLIA PETROLEUM COMPANY

P. O. BOX 900

DALLAS 21, TEXAS

HELP WANTED

OIL FIELD SUPPLY SALESMAN
City Sales in Tulsa. Supply store experience and knowledge of production equipment necessary. Contacts with major and independent operators required. Salary open. P. O. Box 2295, Tulsa, Okla.

GEOLOGIST of outstanding ability, under 35, with at least 3 years' experience in northern Louisiana, gulf coast and west Texas areas. Exploration and development experience essential for Dallas office of established independent oil concern. P. O. Box 2775, Dallas, Texas.

WATER-FLOOD ENGINEER—by independent oil-producing company. Should have field experience in Mid-Continent area water-flood development and operation. Reply should state qualifications and experience in detail. All applications confidential. Box H-673, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER with 6-8 years experience in process control, process design and economics to be in charge of Engineering Department in small Midwest Refinery. Reply should include resume of experience, education, references and salary expected. Box H-861, The Oil and Gas Journal, Tulsa, Oklahoma.

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P. O. Box 1133, Houston 1, Texas

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CHEMICAL ENGINEER, with or without experience, for employment in natural gasoline department progressive independent oil company. Must be willing to work in Texas, California or Canada. Prefer a man under 35. Box H-881, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST: Exploration Company has immediate opening for subsurface geologist with 3 to 5 years experience, preferably in Oklahoma. Location in Tulsa. Mail resume including personal history, employment record, educational background and salary requirements to Apache Oil Corporation, 823 South Detroit, Tulsa. All replies confidential.

DISTRICT LANDMAN Position Open. Strong, independent company has position for District Landman at Midland, Texas. Applicant should supply complete resume of experience and qualifications which will be treated confidentially. Box H-868, The Oil and Gas Journal, Tulsa, Oklahoma.

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Excellent opportunity for young Chemical Engineer in natural gas division of a large progressive independent oil company. Prefer recent graduate or individual with no more than one or two years experience. To be located in Oklahoma. Please submit college transcript and recent photograph.

GEOLOGIST

Recent Geological or Geological Engineering graduates wanted for employment as seismo computer. Will be working with field seismic parties. Excellent opportunity for advancement. Please submit college transcript and recent photograph.

Box H-864, The Oil and Gas Journal, Tulsa, Oklahoma.

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BOX H-878,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

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Interview arranged our expense on basis complete confidential chronological resume including education and employment (names and addresses or employers, dates employed, positions held and your specific duties and scope of responsibility, salaries received, location and type of jobs, etc.). Airmail data to

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HELP WANTED

NEED PRODUCTION MAN capable supervising 300 barrels production. Must be able handle completion work, all types and depths. Want non-drinker and Christian. Advise past record, age, salary expected, education, availability. Box H-783, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum & Civil Engineers. Large producing oil company with expanding offshore drilling and production operations needs Petroleum and Civil Engineers for work in their production department. Petroleum Engineers with four years or less experience will be placed in drilling or production engineering work. Civil Engineers with three years or less experience will be placed in the department's construction division. Please write stating age, experience, school, date graduated, etc. Personal interview will be arranged. All replies strictly confidential. Our fee paid. Contact Tom Robinson, owner, Oil Industry Employment Service, P. O. Box 2603, Tulsa, Okla. Phone 4-5974.

SUBSTANTIAL independent operating company would like to permanently employ an exploration geologist. Must be experienced, qualified, and have the ability to head an exploration program, operating in Oklahoma and Kansas. Send detailed personal history, work experience & salary expected. Box H-847, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOPHYSICIST—Eight years seis. experience Southwest, desires employment with active company or independent. Box H-879, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER, five years production, secondary recovery, field responsibility, seeks connection with active independent. Box H-877, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 6 yrs. experience exploration and development East Texas and Gulf Coast, married, 32 yrs. old. Desires change. Box H-762, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE GEOLOGIST, 18 years experience, exploration and exploitation geology in Rocky Mountain Area. Desires association with small integrated company or independent. At present in management of major company. Box H-880, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING FOREMAN, 30, desires employment with aggressive independent operator or any growing concern serving the oil industry. Thorough experience in drilling operations and well completions. Write 202 Holly Dr., Midland, Texas, Phone 2-2879.

LANDMAN, eight years experience in title work, leasing, farmouts, administration with major company desires position with small company or independent. Box H-875, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEM. ENGR.—41—15 yrs. wide experience all phases refining thru management level. Box H-871, The Oil and Gas Journal, Tulsa, Oklahoma.

PILOT—A.T.R. with single, multi-engine, and DC-3 ratings, graduate petroleum engineer. Experience in both lines. Interested in flying position, sales, or combination. Burt Hull, Jr., 2230 E. 31st., Tulsa.

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JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

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CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Investments.

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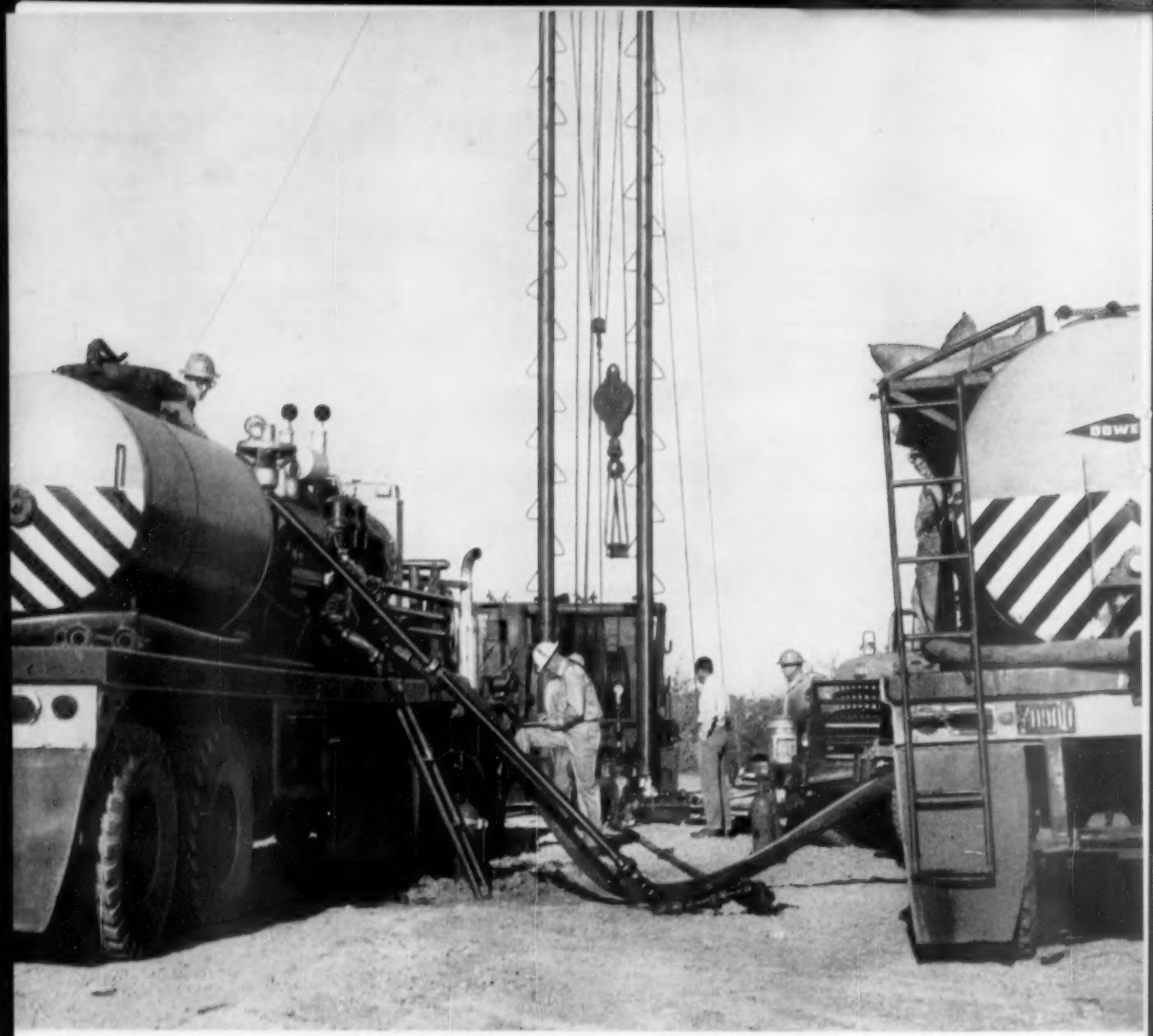
LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 280 acres of land in four separate parcels within the known geologic structures of the Mush Creek and Southeast Skull Creek Fields, Weston County, Wyoming, are offered for oil and gas leasing through sealed bids to the qualified bidder of the highest amount per acre at 2:00 P.M., MST, July 21, 1955, when bids will be opened. Details of the lease offering and how and where to submit bids may be obtained from the Land Office at Cheyenne, Wyoming. Perry T. Williams, Manager.



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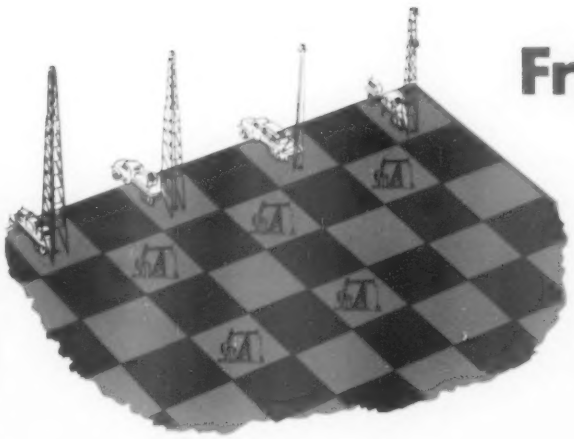

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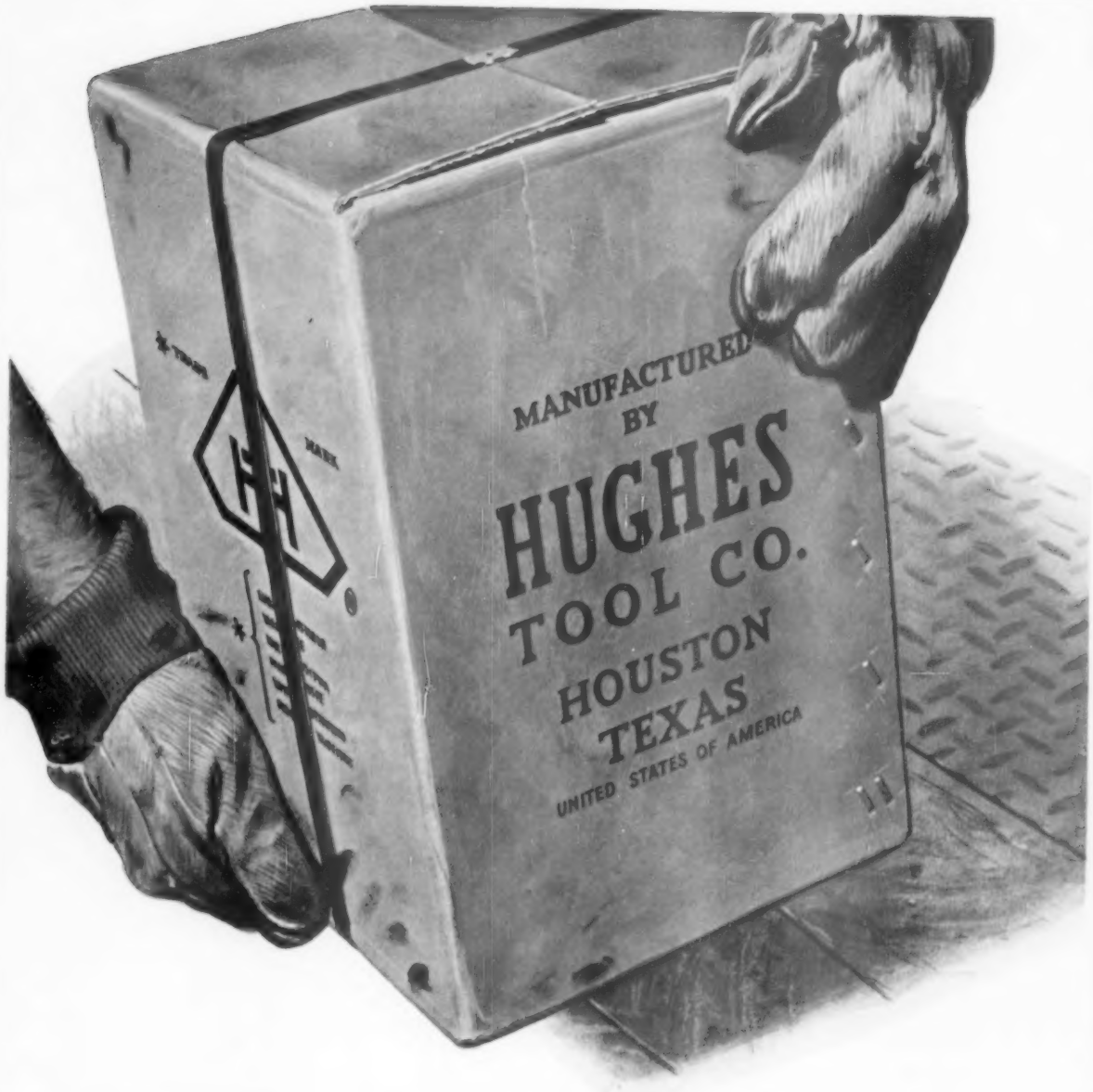

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